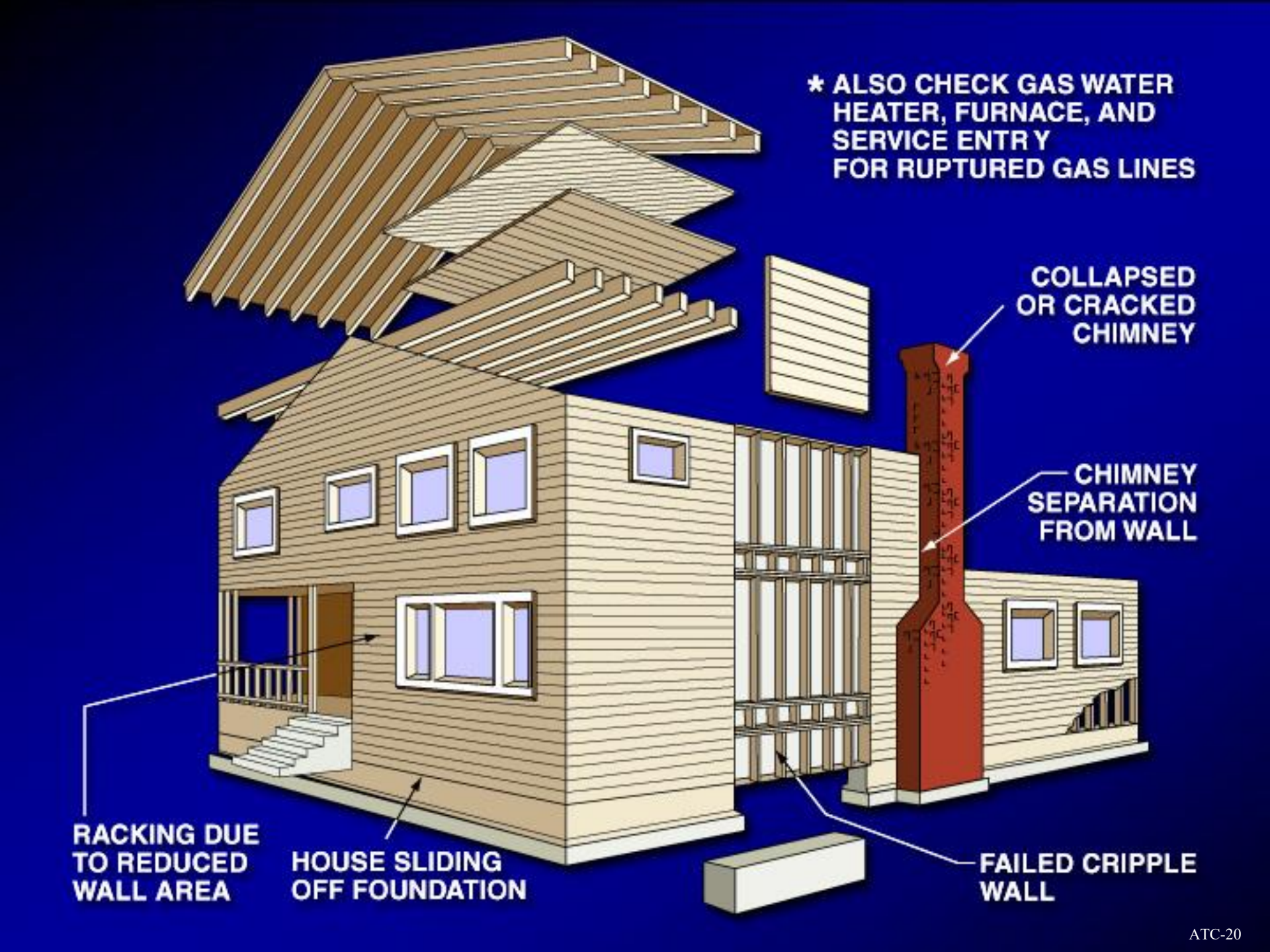
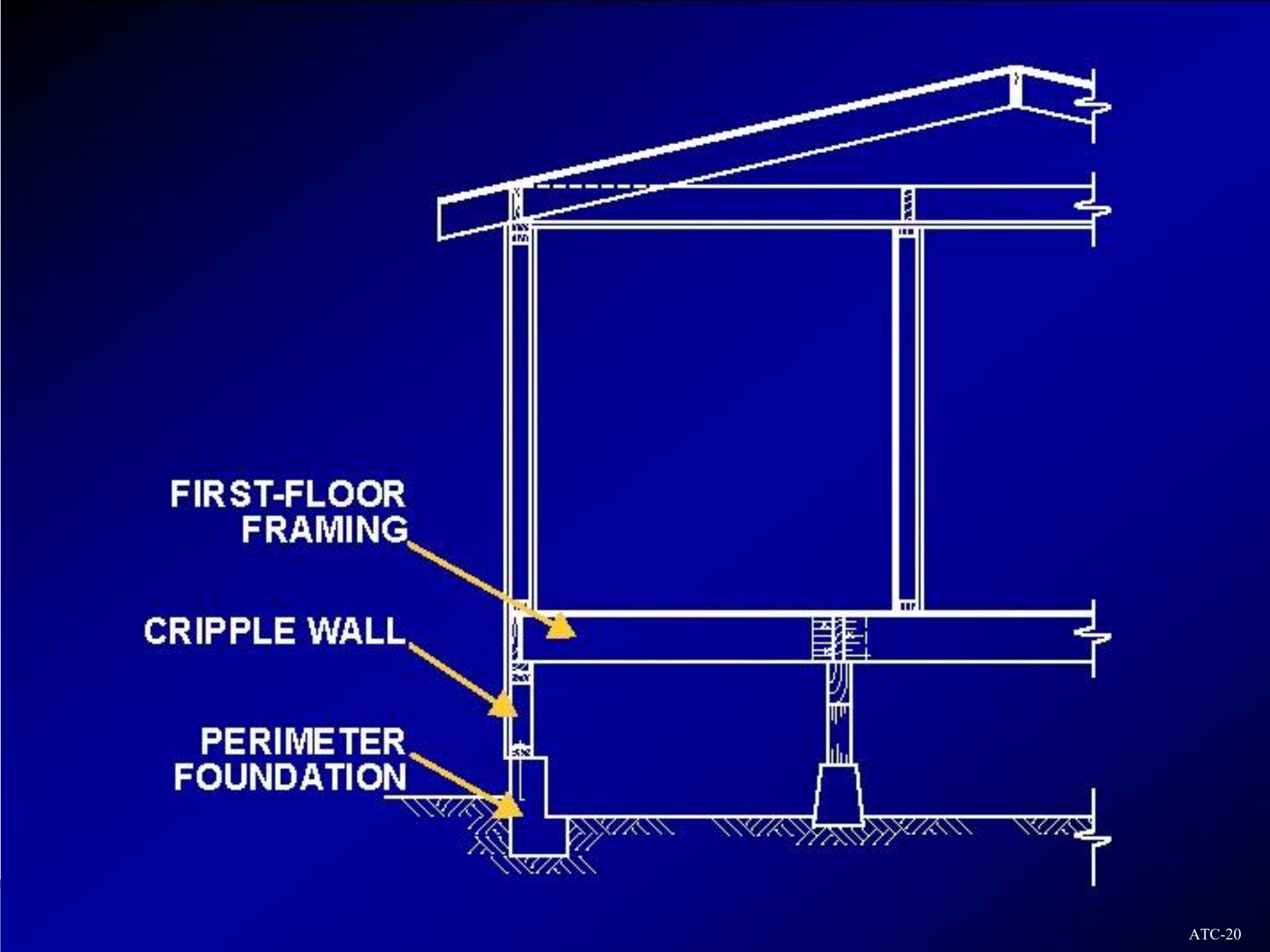
WOOD-FRAME CONSTRUCTION

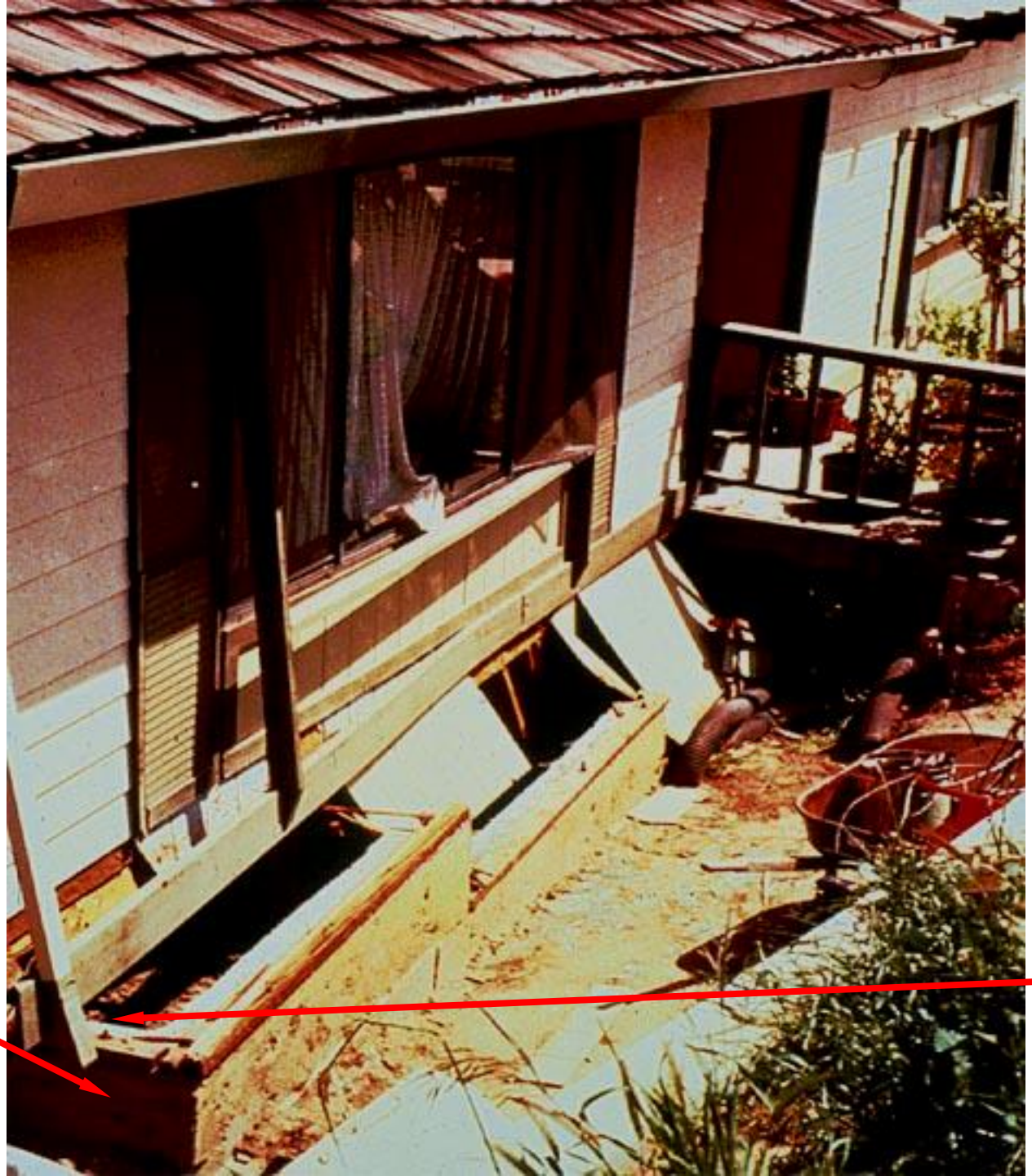
WOOD-FRAME CONSTRUCTION

Single-family residential

Multi-unit residential and commercial


* ALSO CHECK GAS WATER HEATER, FURNACE, AND SERVICE ENTR Y FOR RUPTURED GAS LINES
COLLAPSED OR CRACKED CHIMNEY
CHIMNEY SEPARATION FROM WALL
RACKING DUE TO REDUCED WALL AREA
HOUSE SLIDING OFF FOUNDATION
FAILED CRIPPLE WALL


FIRST-FLOOR FRAMING
CRIPPLE WALL
PERIMETER FOUNDATION

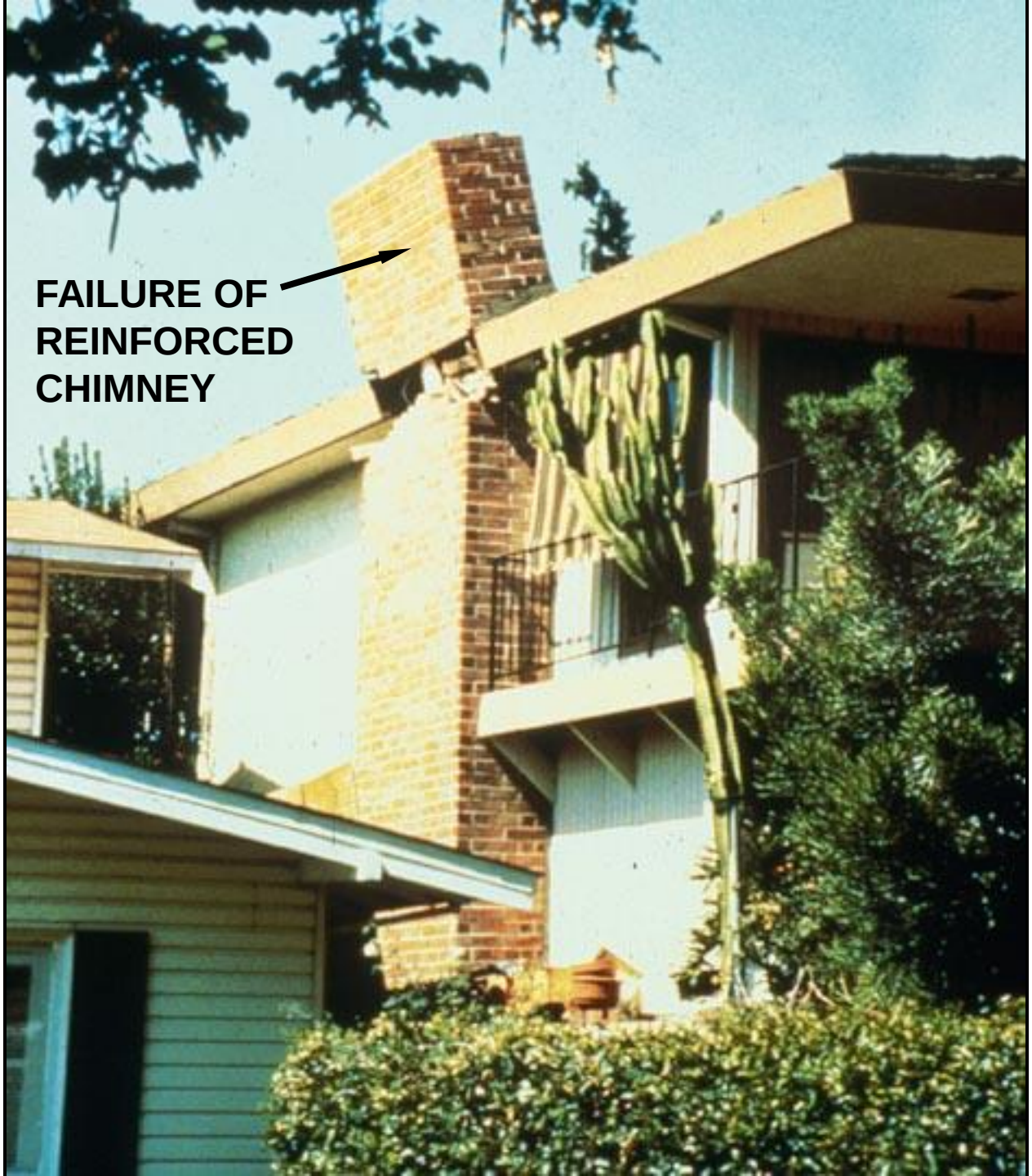

CONCRETE PERIMETER WALL FOUNDATION
FAILED CRIPPLE WALL


RACKING OF UNFINISHED LOWER LEVEL
TIMBER CRIBBING INSTALLED

ATC-20


WOOD
SUPERSTRUCTURE
SLIDING ON
FOUNDATION


FAILURE OF
UNREINFORCED
CHIMNEY


FAILURE OF
REINFORCED
CHIMNEY

FAILURE OF BRICK VENEER

MASONRY CONSTRUCTION

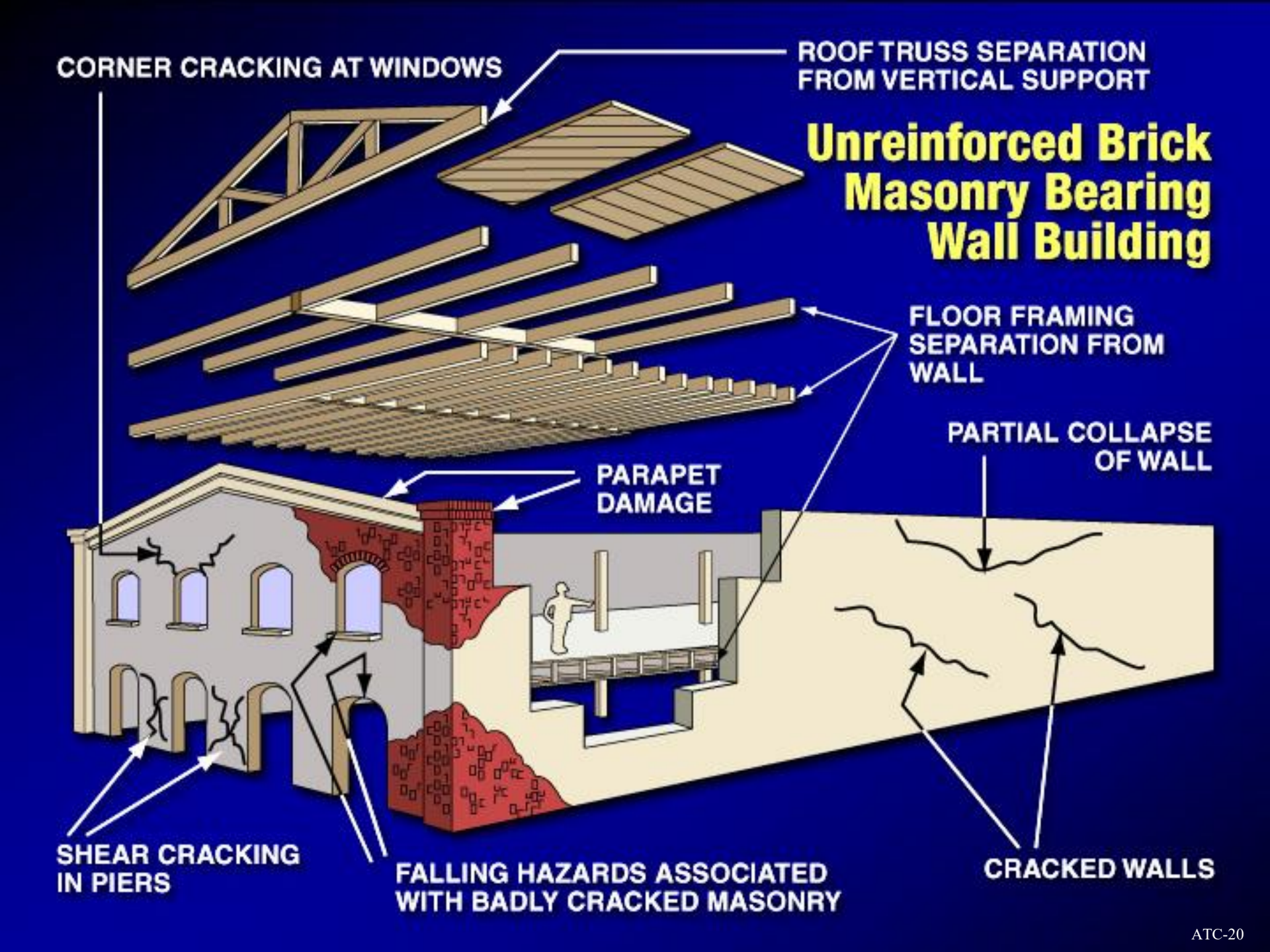
MASONRY CONSTRUCTION

Unreinforced brick masonry bearing wall buildings

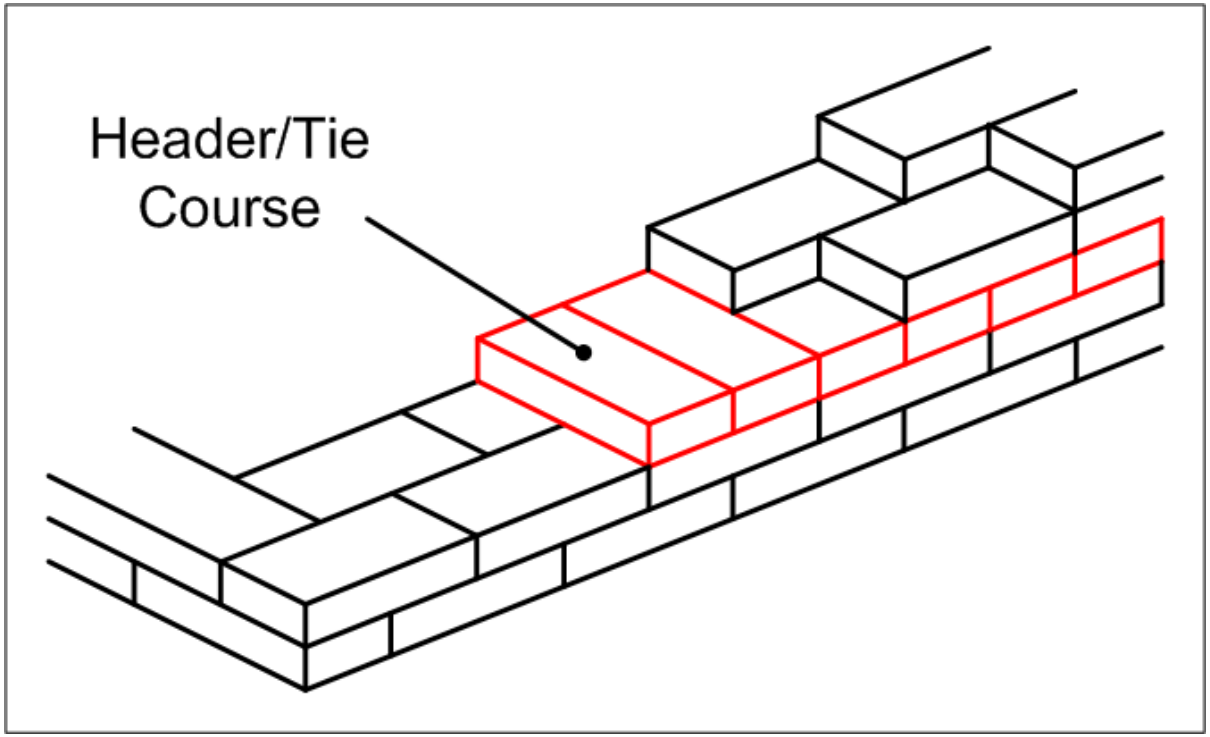
Unreinforced concrete block masonry bearing wall buildings

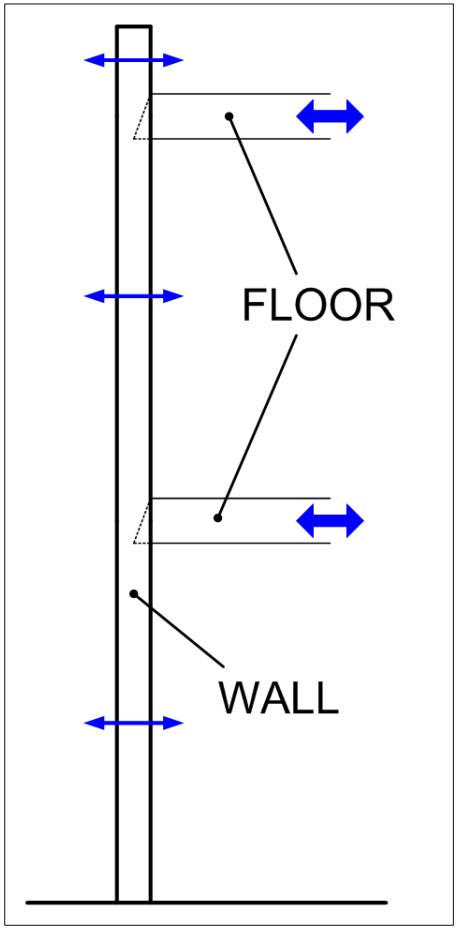
Steel-frame with masonry infill buildings

Reinforced masonry buildings


CORNER CRACKING AT WINDOWS
ROOF TRUSS SEPARATION FROM VERTICAL SUPPORT
Unreinforced Brick Masonry Bearing Wall Building
FLOOR FRAMING SEPARATION FROM WALL
PARTIAL COLLAPSE OF WALL
PARAPET DAMAGE
SHEAR CRACKING IN PIERS
FALLING HAZARDS ASSOCIATED WITH BADLY CRACKED MASONRY
CRACKED WALLS

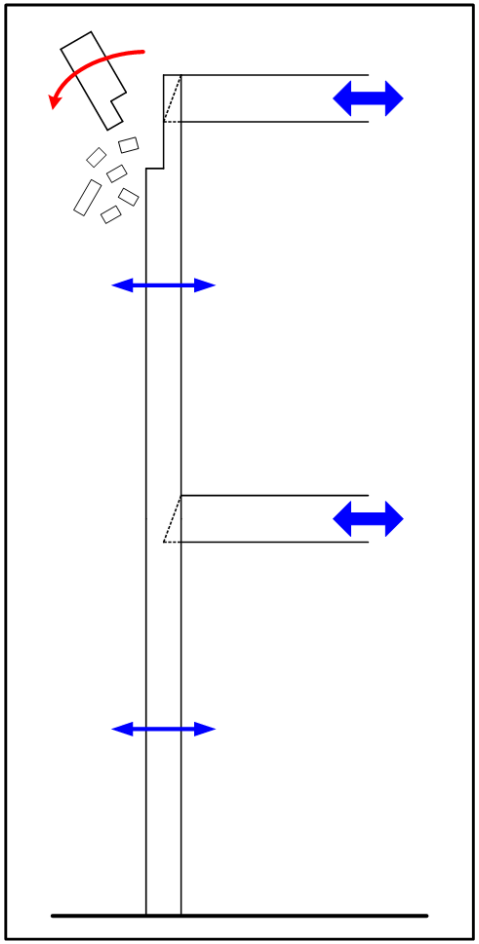
WHAT IS A URM?

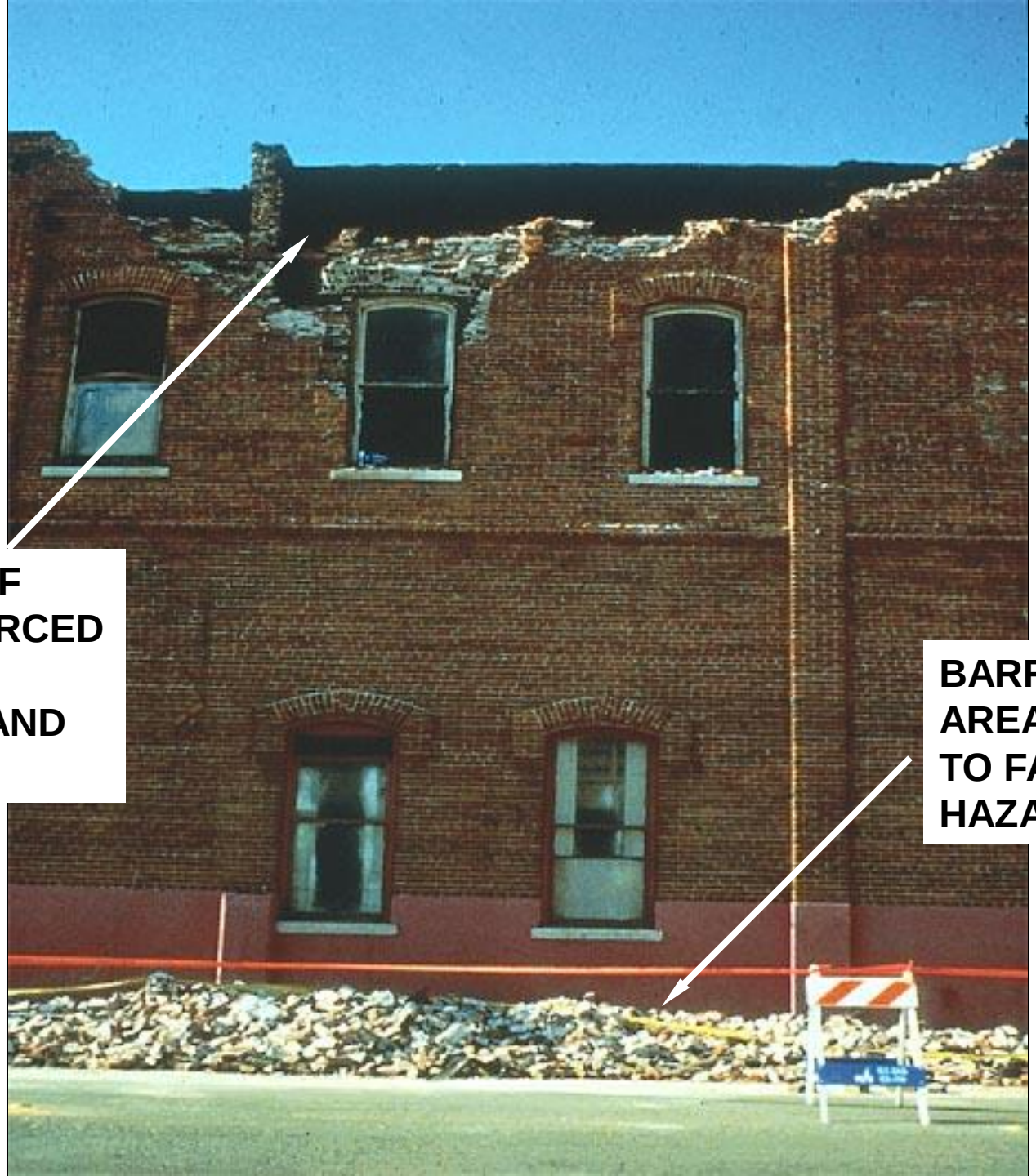


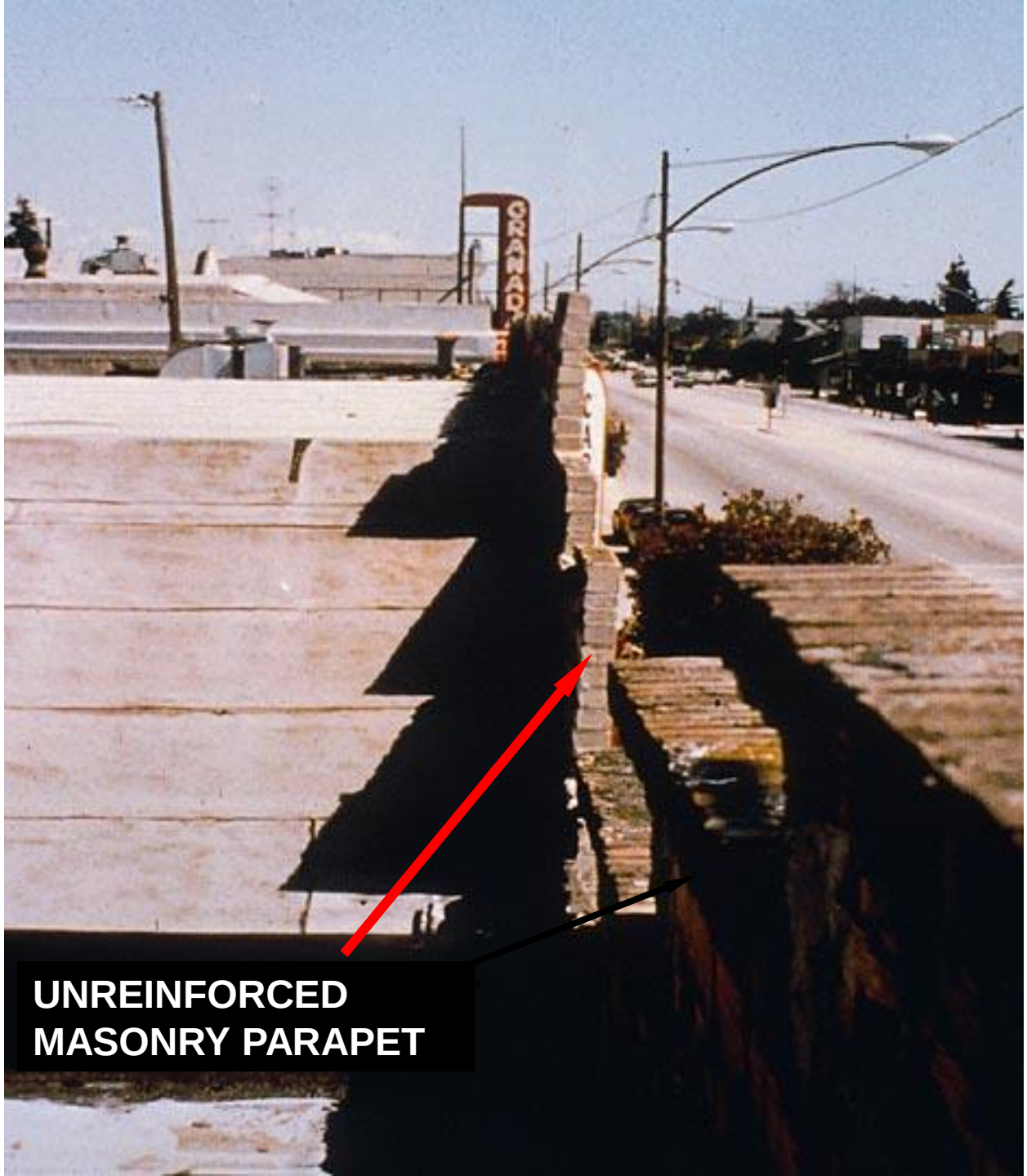



FALLEN
OUTER
WYTHE
TIE COURSES

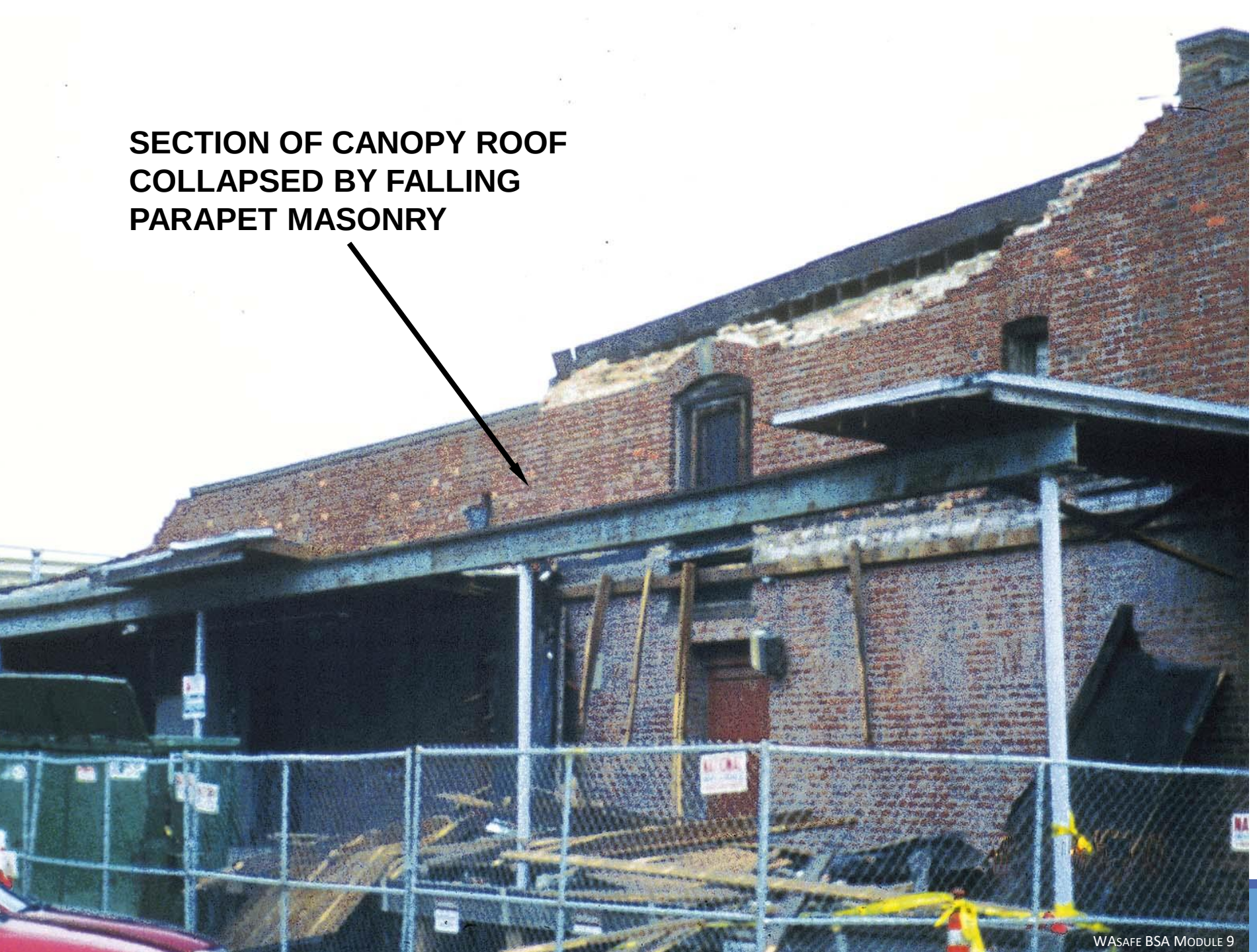
EARTHQUAKE (MIS)BEHAVIOR

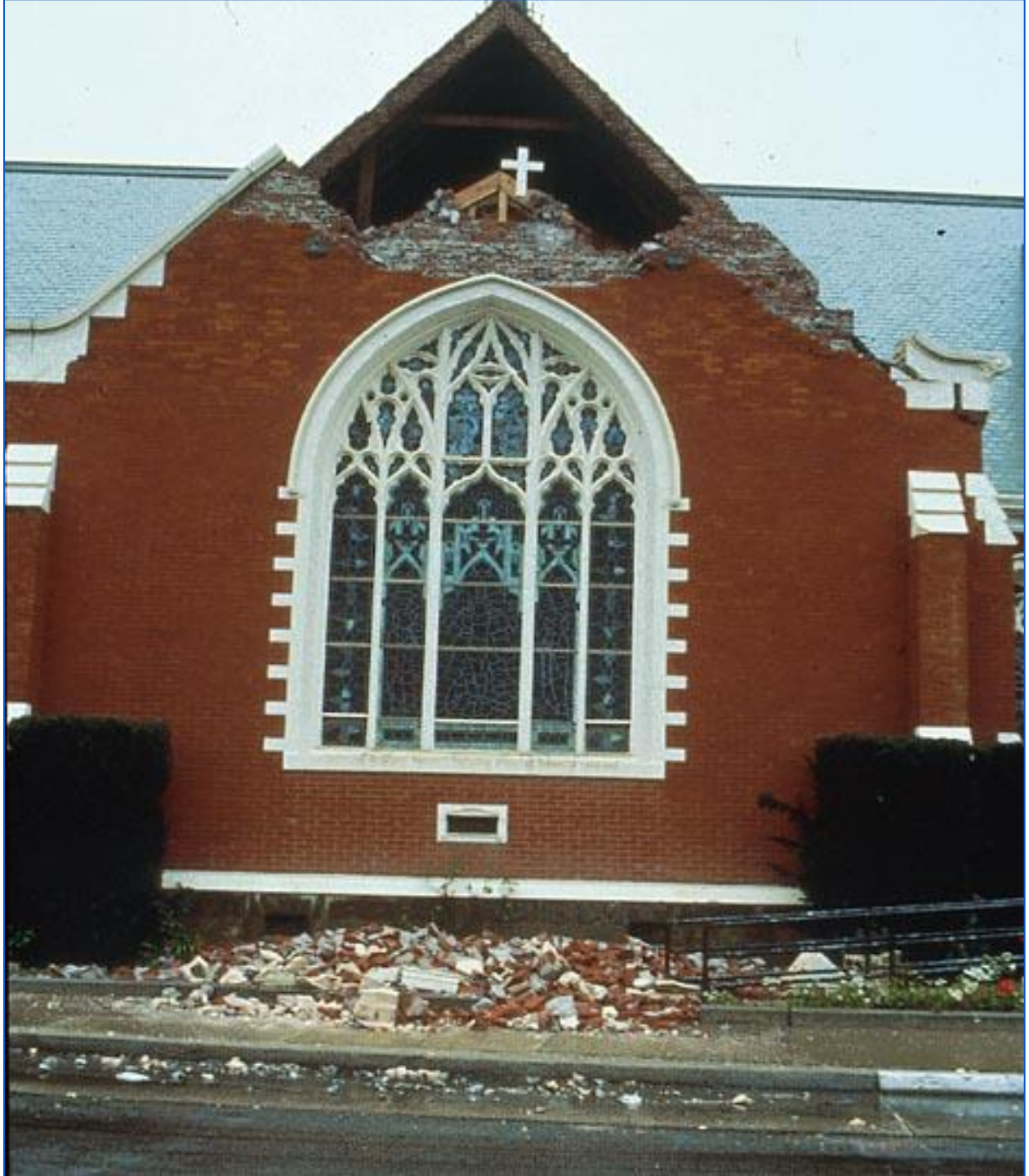


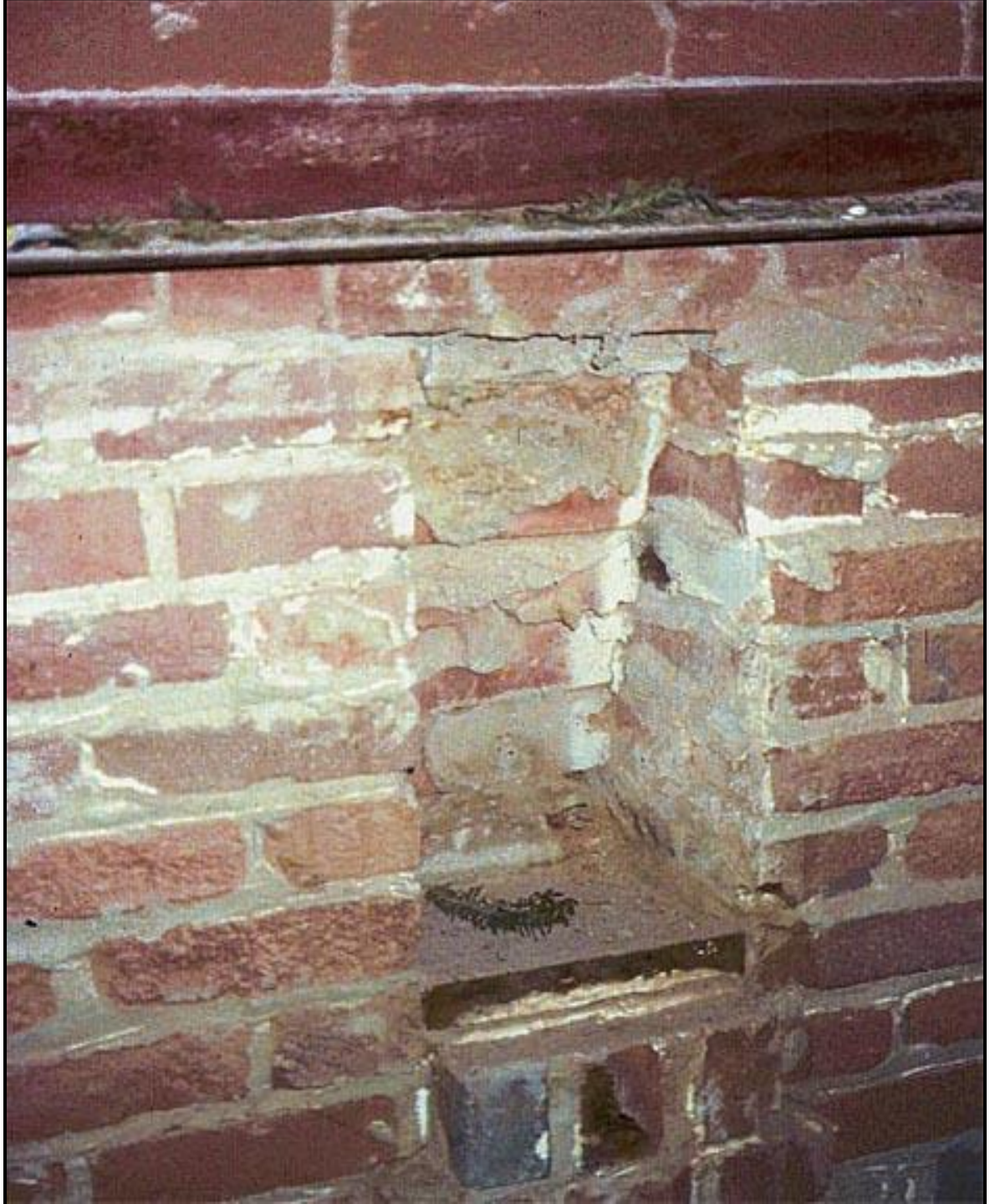

FAILURE OF UNREINFORCED MASONRY PARAPET AND WALL
BARRICADED AREA SUBJECT TO FALLING HAZARD


UNREINFORCED
MASONRY PARAPET


Mauro

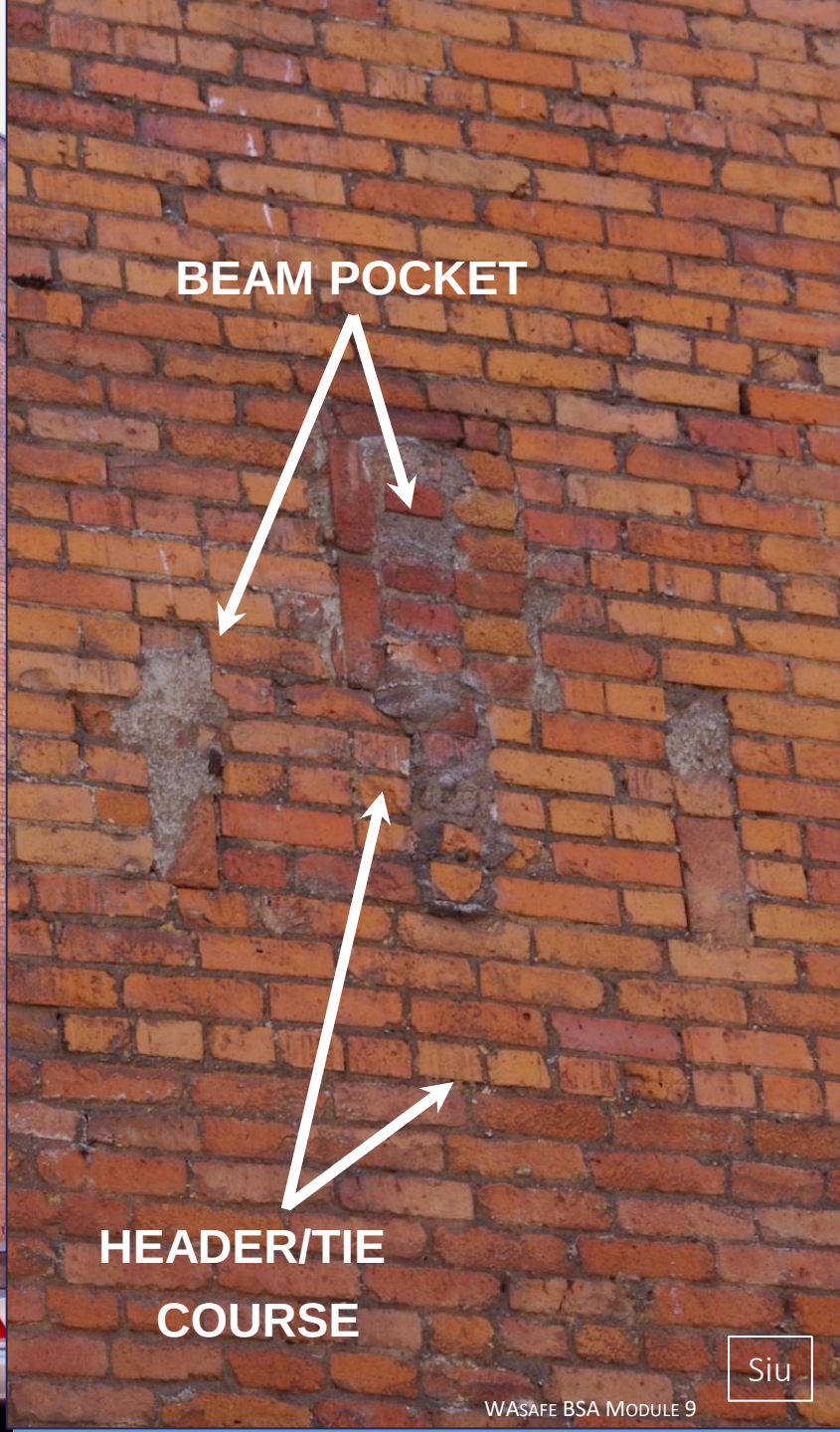

SECTION OF CANOPY ROOF
COLLAPSED BY FALLING
PARAPET MASONRY





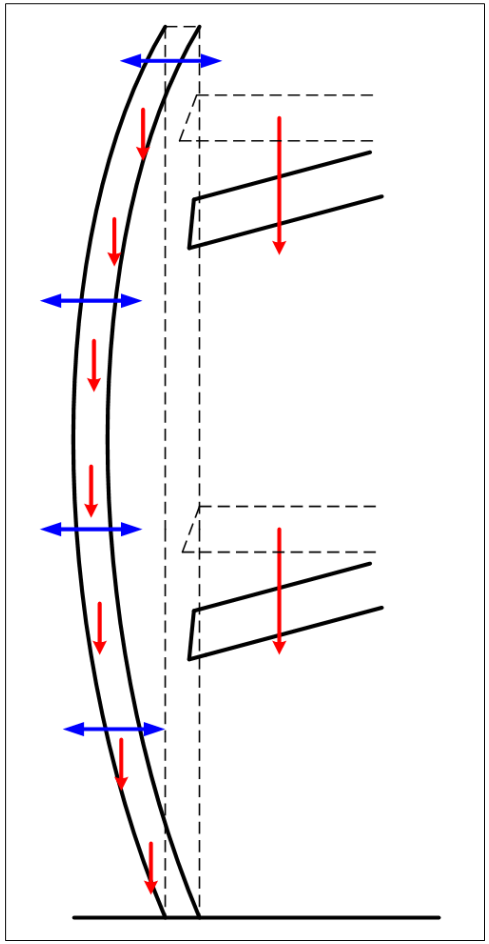

DIAMOND
0-1 HOURS $3.00
EACH ADD. HOUR $3.00
EVENINGS AFTER 5PM $10
PLUS SALES & PARKING TAXES
PLEASE PARK + LOCK
LOT CLOSED

Siu

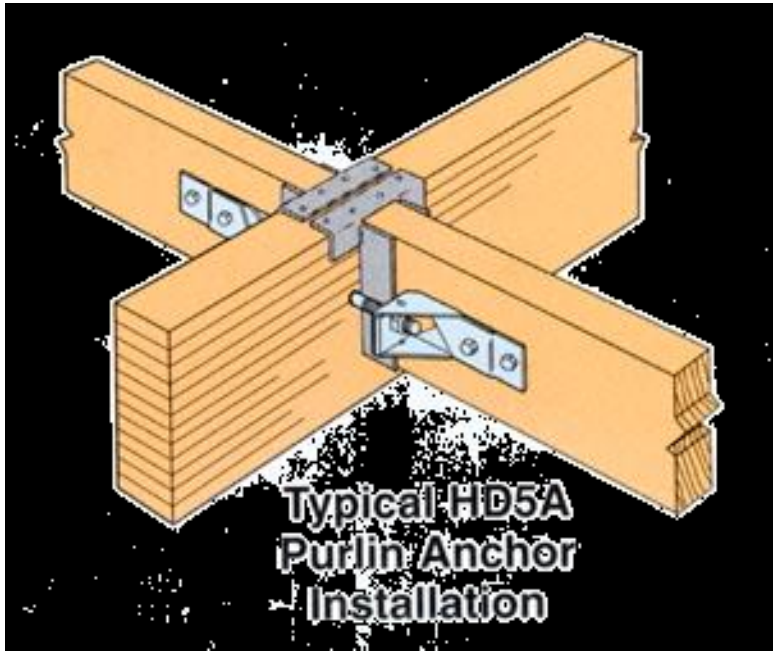

BEAM POCKET
HEADER/TIE COURSE

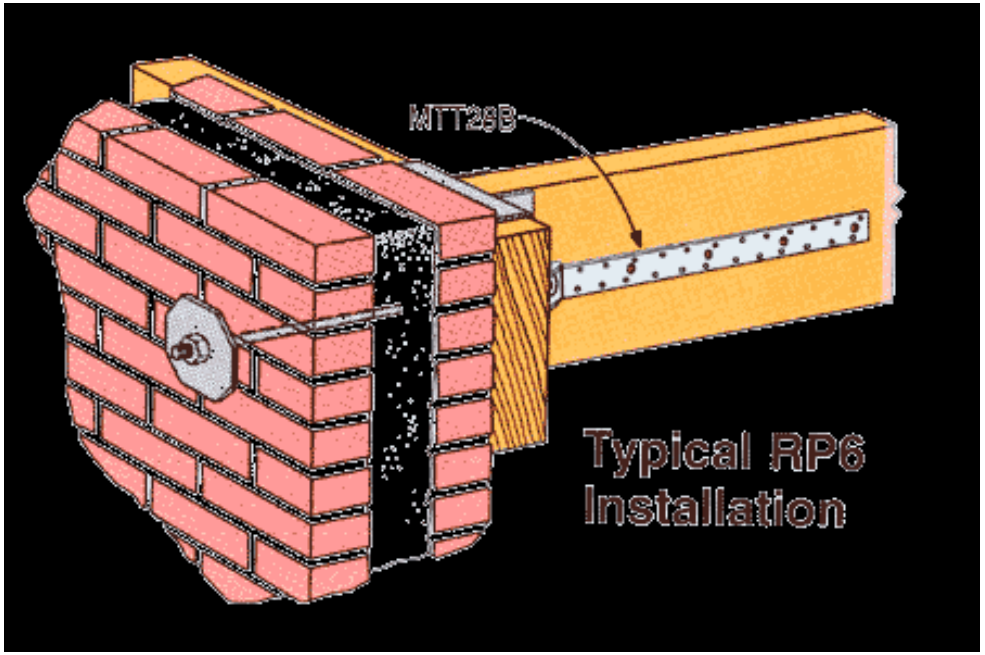
Siu

EARTHQUAKE (MIS)BEHAVIOR



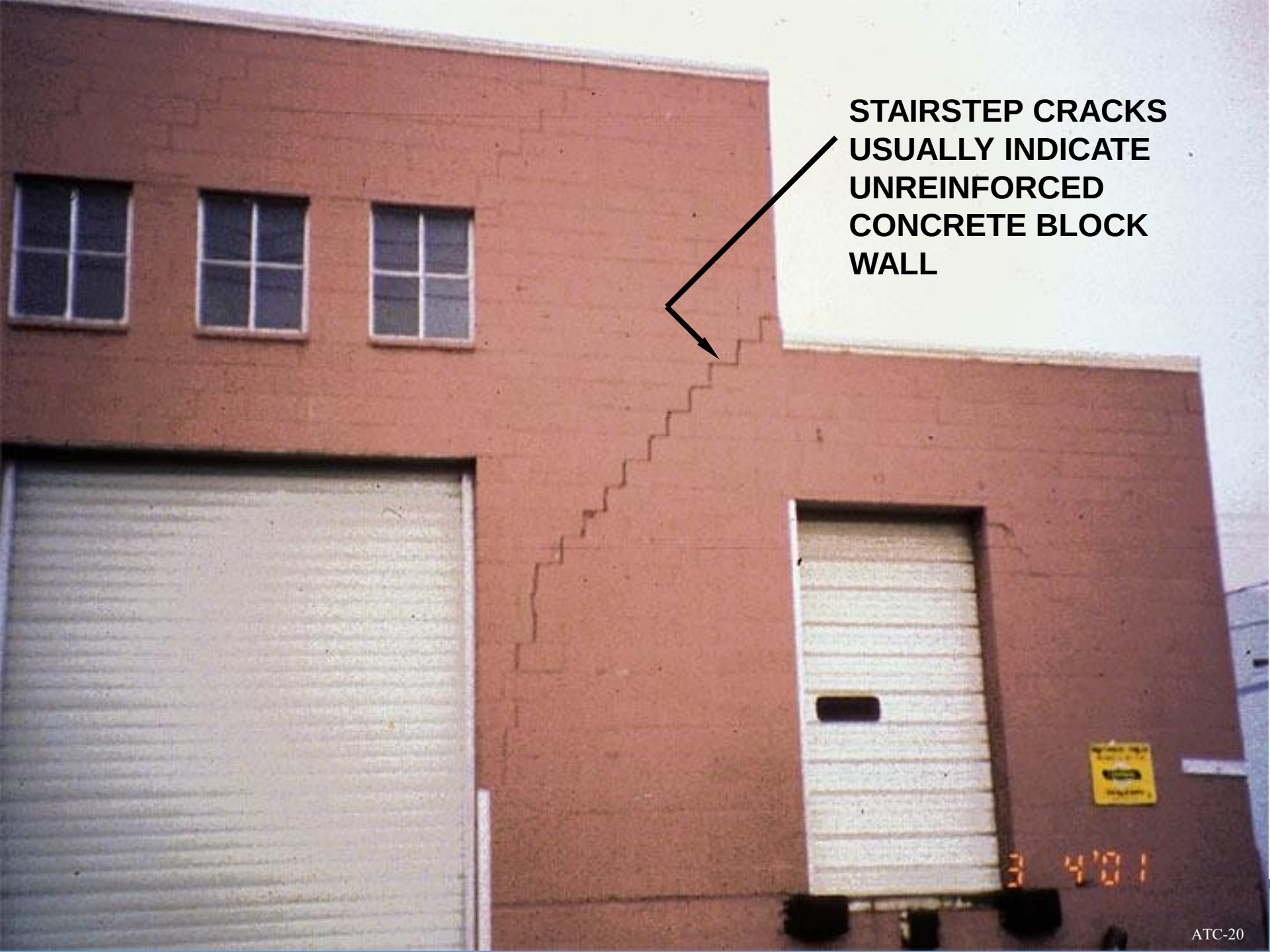
MASONRY WALL ANCHORAGE

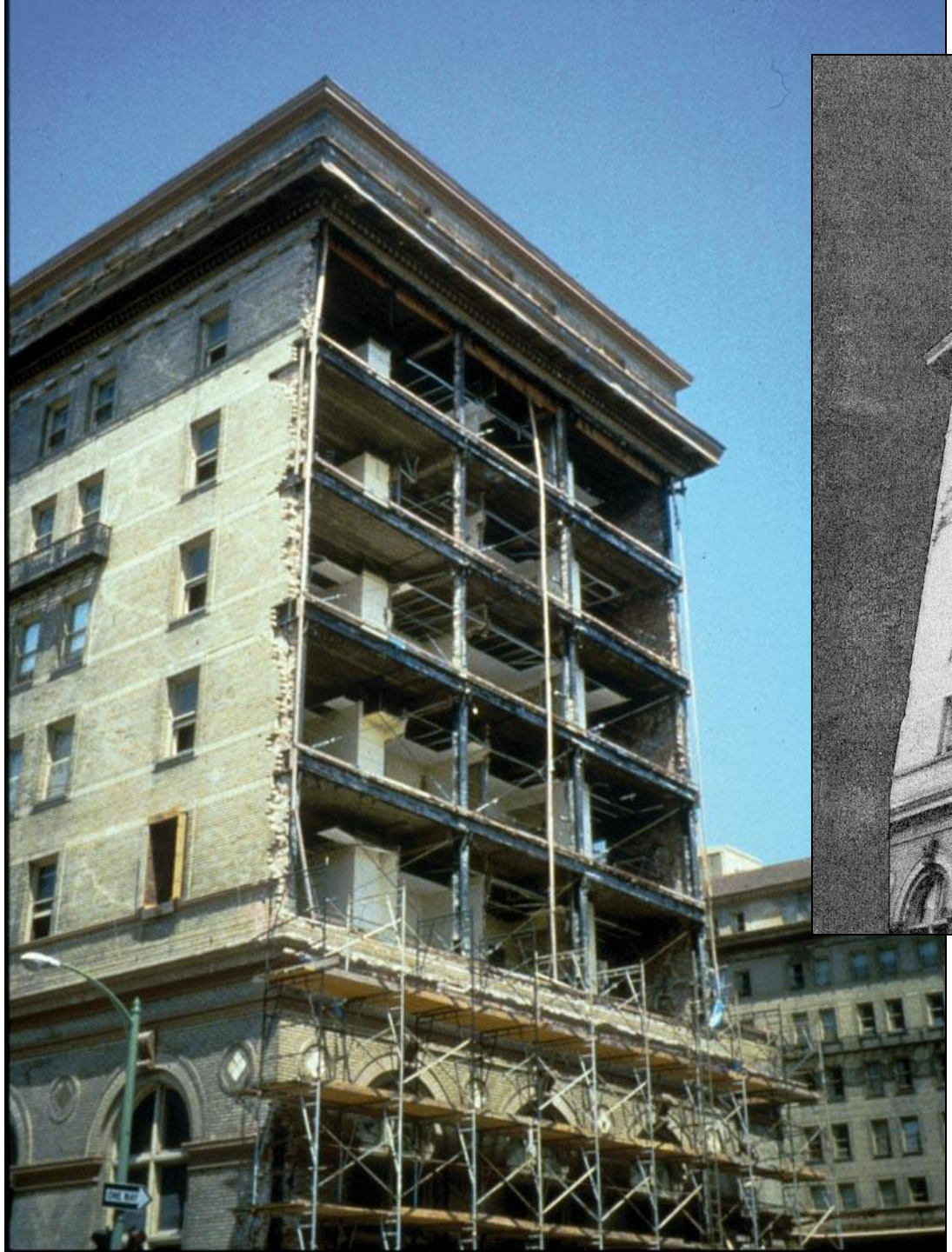


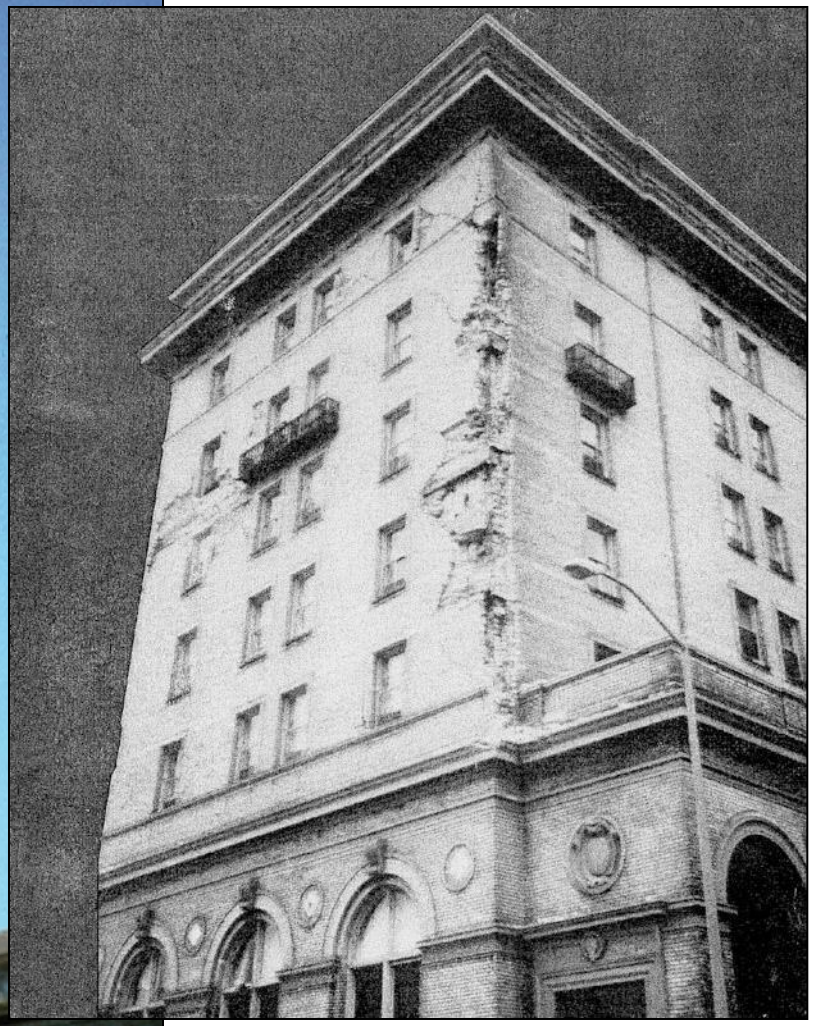



RESERVED
PARKING
Hoover

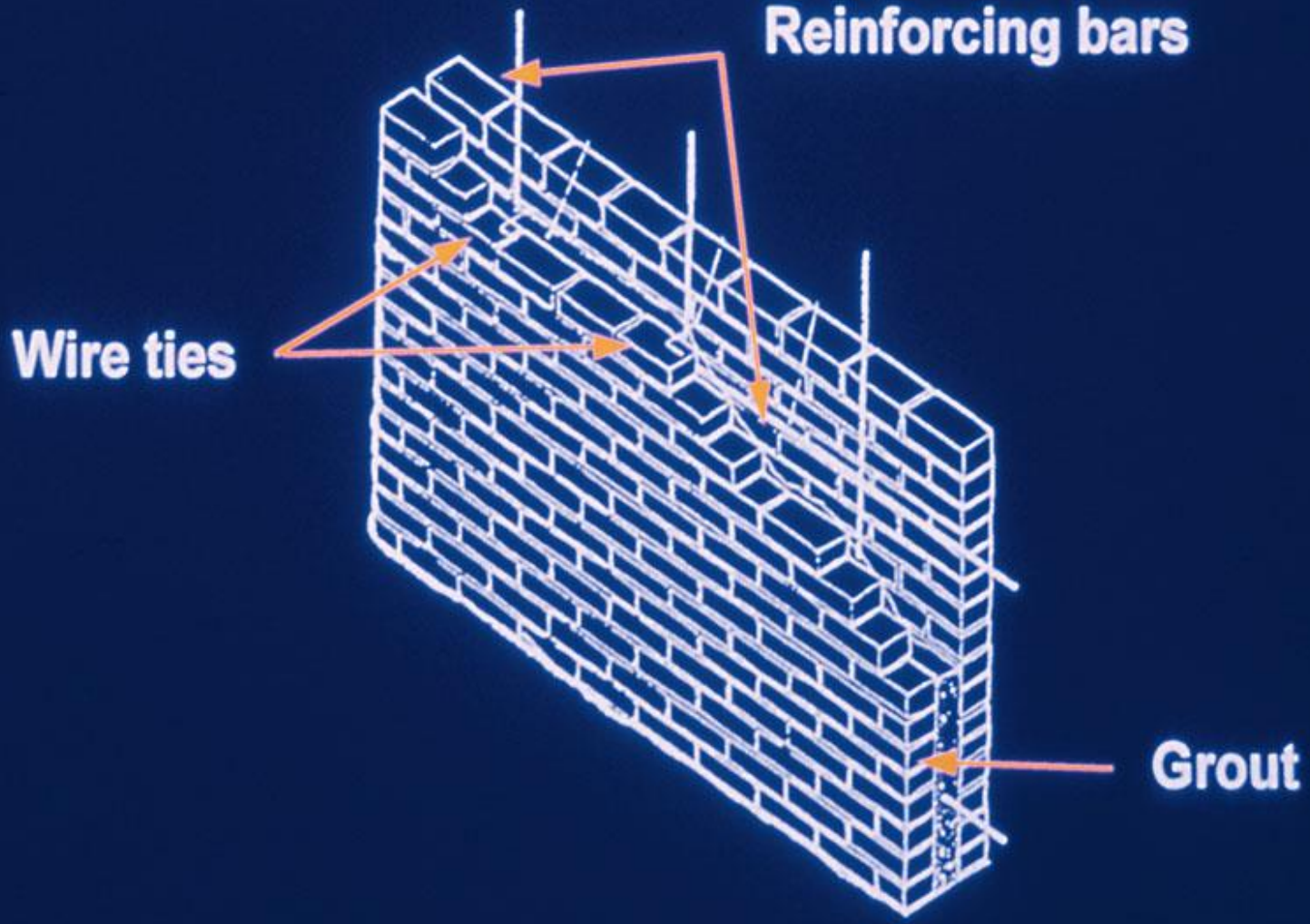

RESTRICTED PARKING
Quaker City
Federal Savings
CUSTOMERS ONLY


STAIRSTEP CRACKS USUALLY INDICATE UNREINFORCED CONCRETE BLOCK WALL

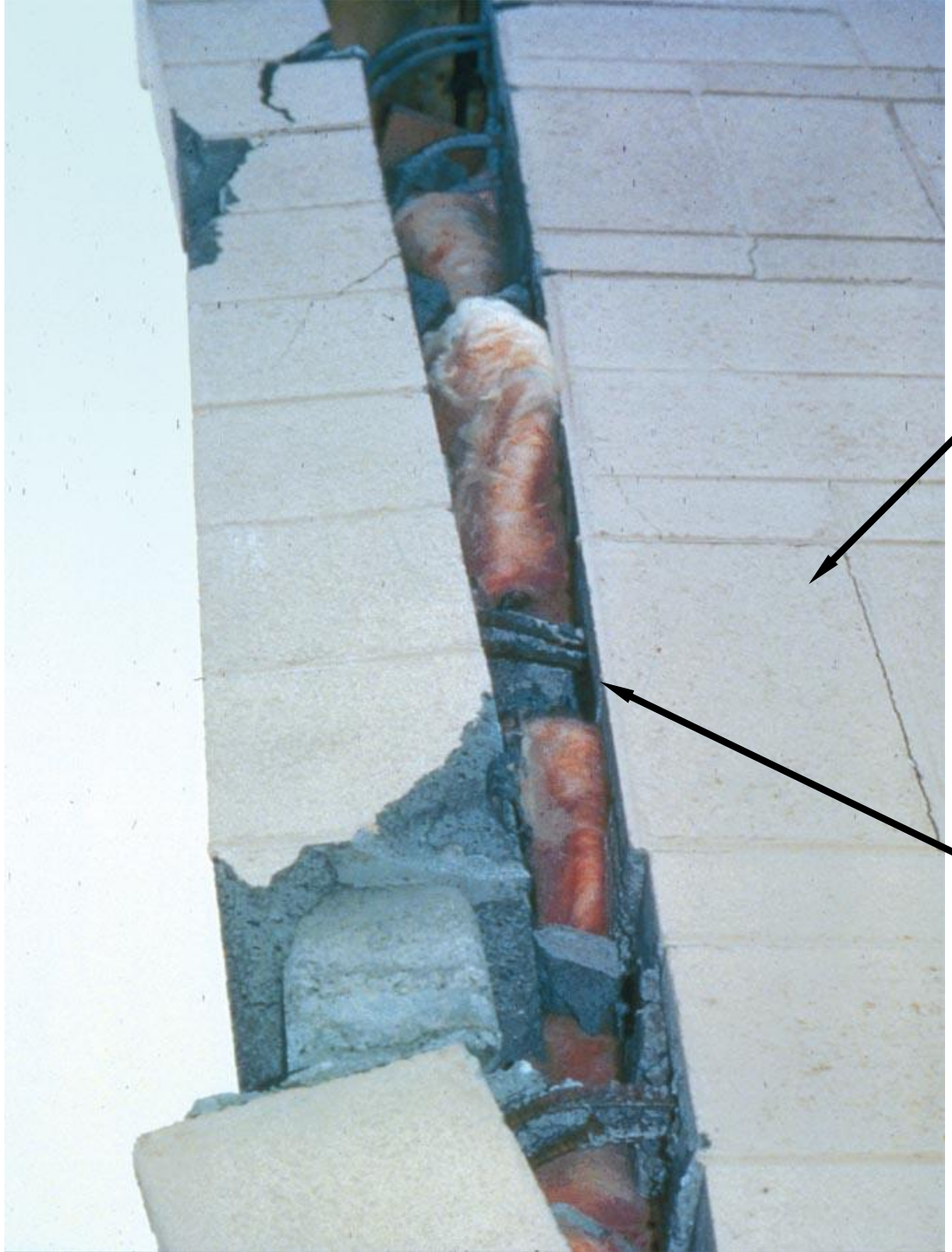


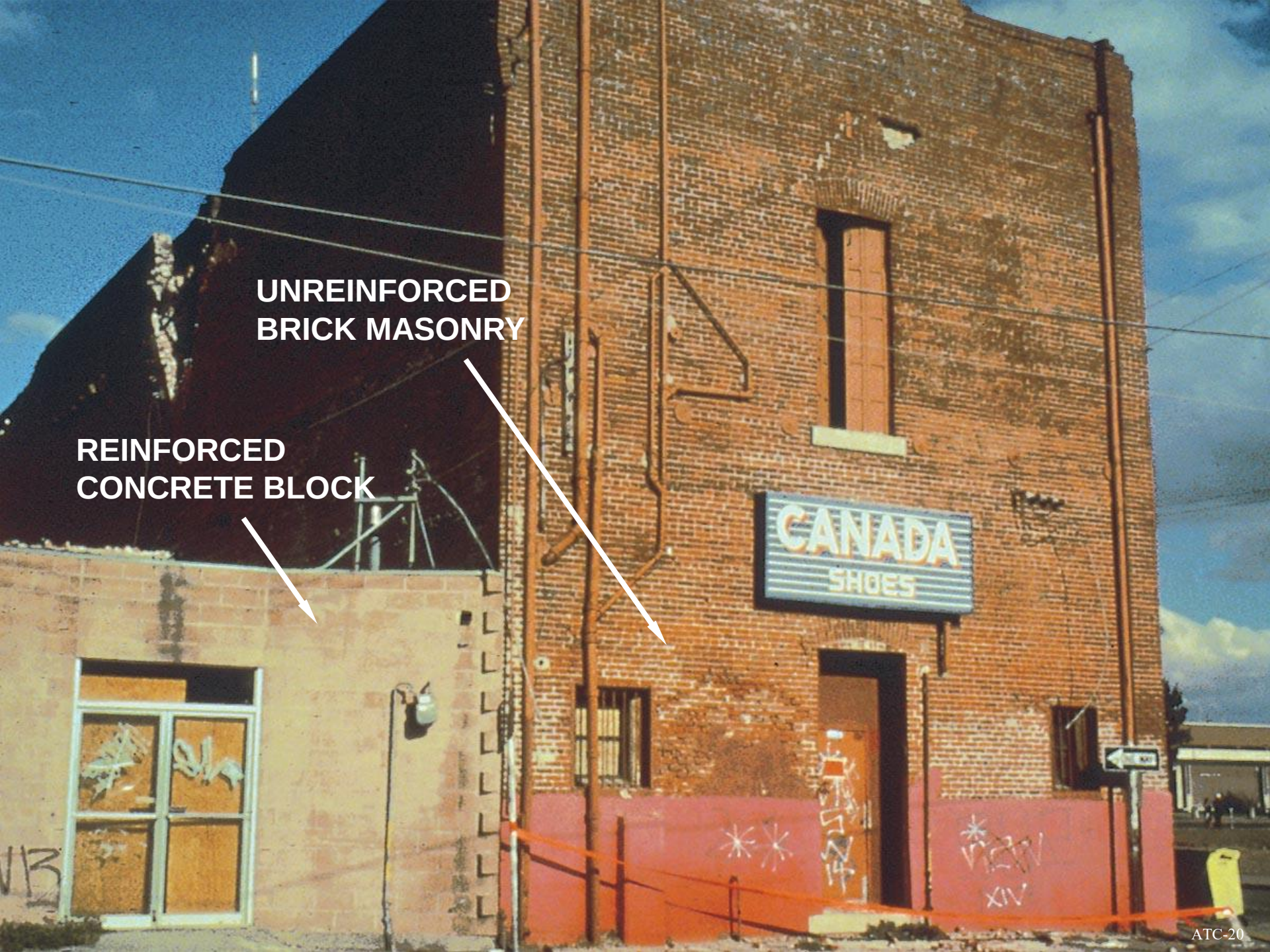


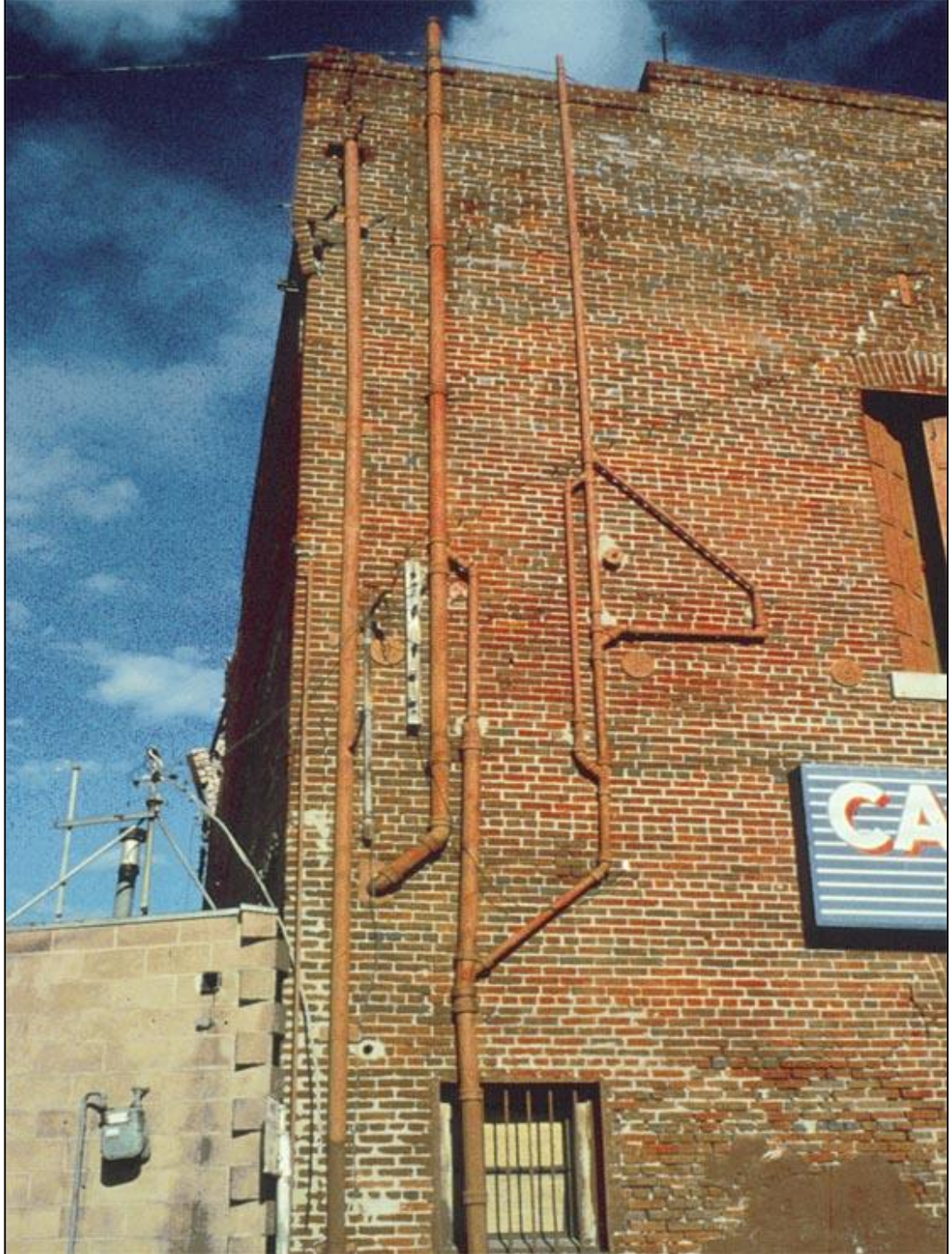
Reinforced Masonry Bearing Wall (RM)




CONCRETE BLOCK MASONRY
HORIZONTAL AND VERTICAL REINFORCING


BLOCKS
PLACED
ON END
CONTINUOUS
VERTICAL
JOINT


UNREINFORCED
BRICK MASONRY
REINFORCED
CONCRETE BLOCK
CANADA
SHOES



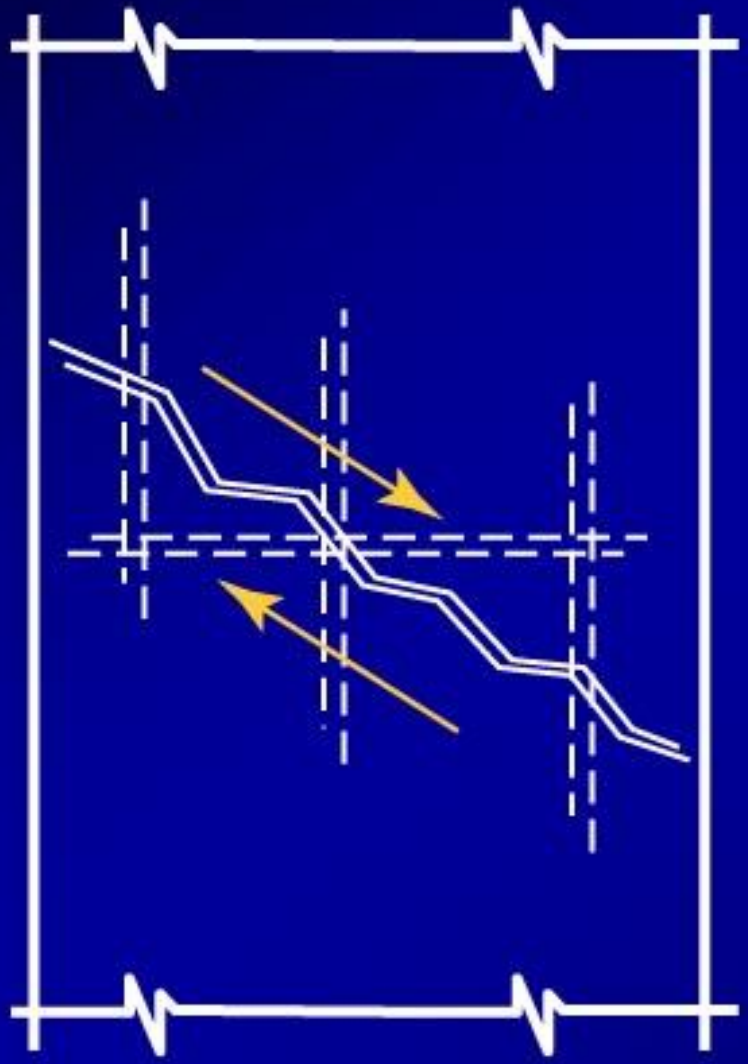
CONCRETE CONSTRUCTION

CONCRETE CONSTRUCTION

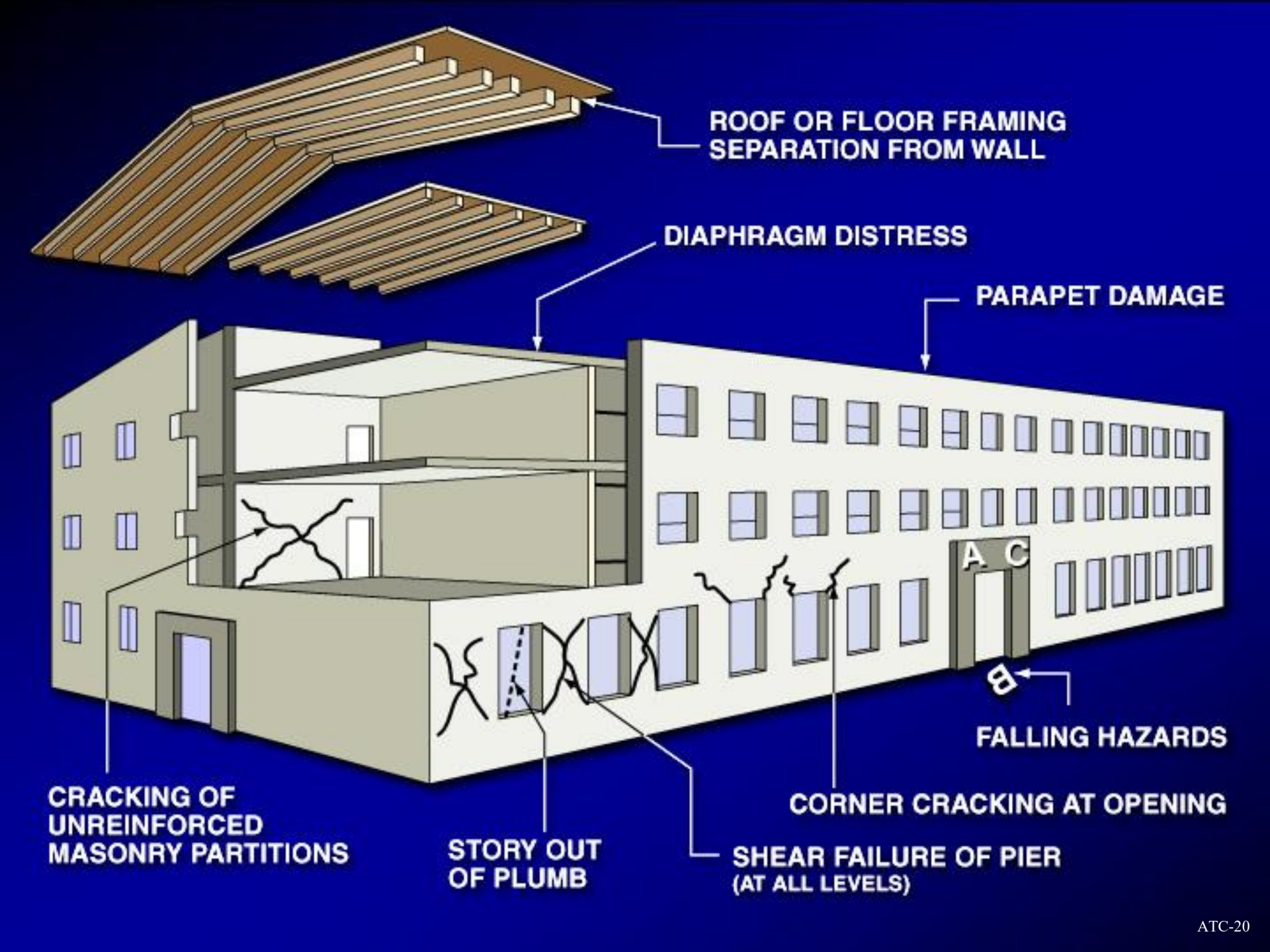
Structural walls or frames

Cast-in-place or precast

Combinations of the above



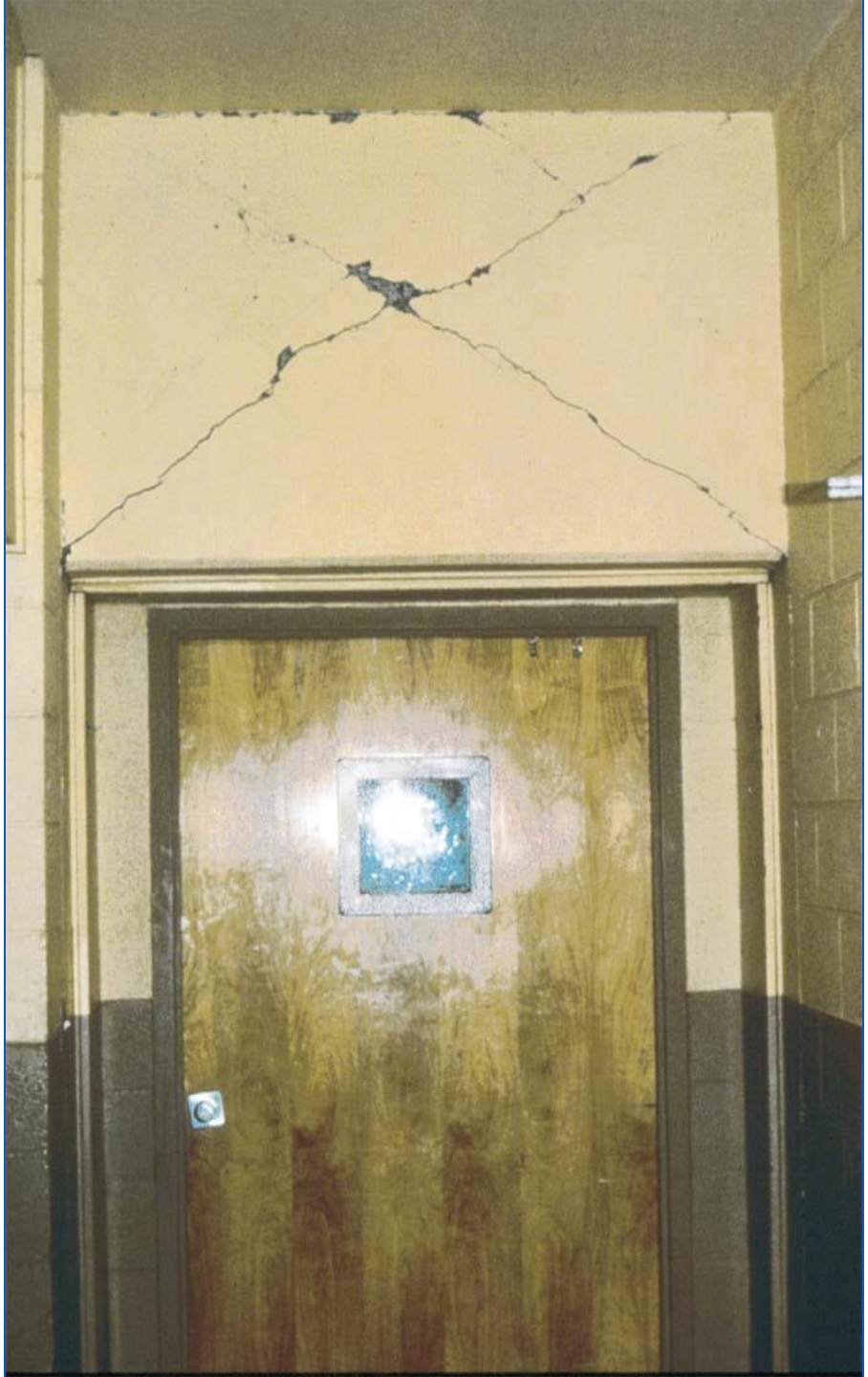
STRENGTH AND STIFFNESS OF REINFORCED CONCRETE


ROOF OR FLOOR FRAMING
SEPARATION FROM WALL
DIAPHRAGM DISTRESS
PARAPET DAMAGE
A C
B
FALLING HAZARDS
CRACKING OF
UNREINFORCED
MASONRY PARTITIONS
STORY OUT
OF PLUMB
CORNER CRACKING AT OPENING
SHEAR FAILURE OF PIER
(AT ALL LEVELS)


DIAGONAL
CRACKS IN
CONCRETE

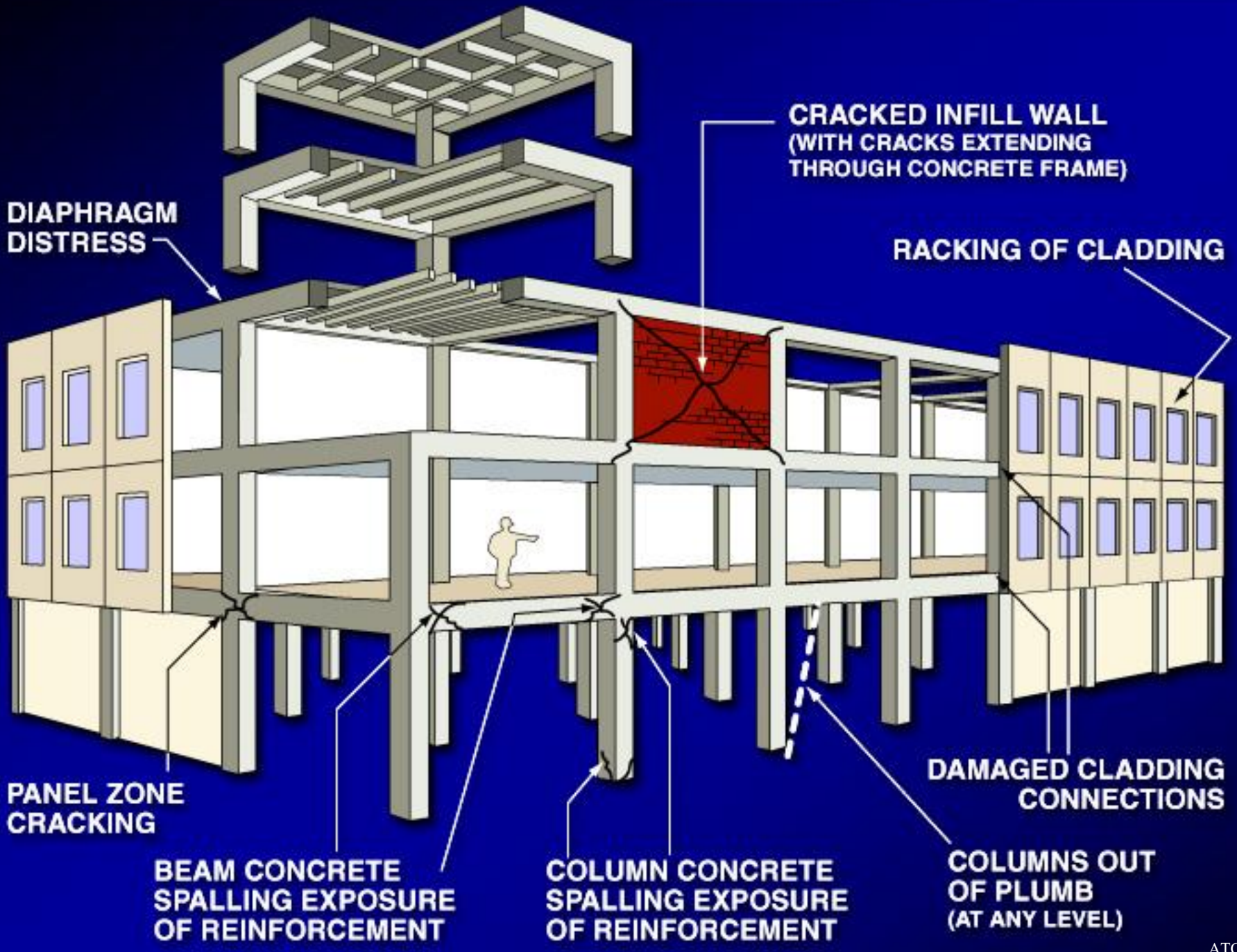
ASCE Chile Reconnaissance Team

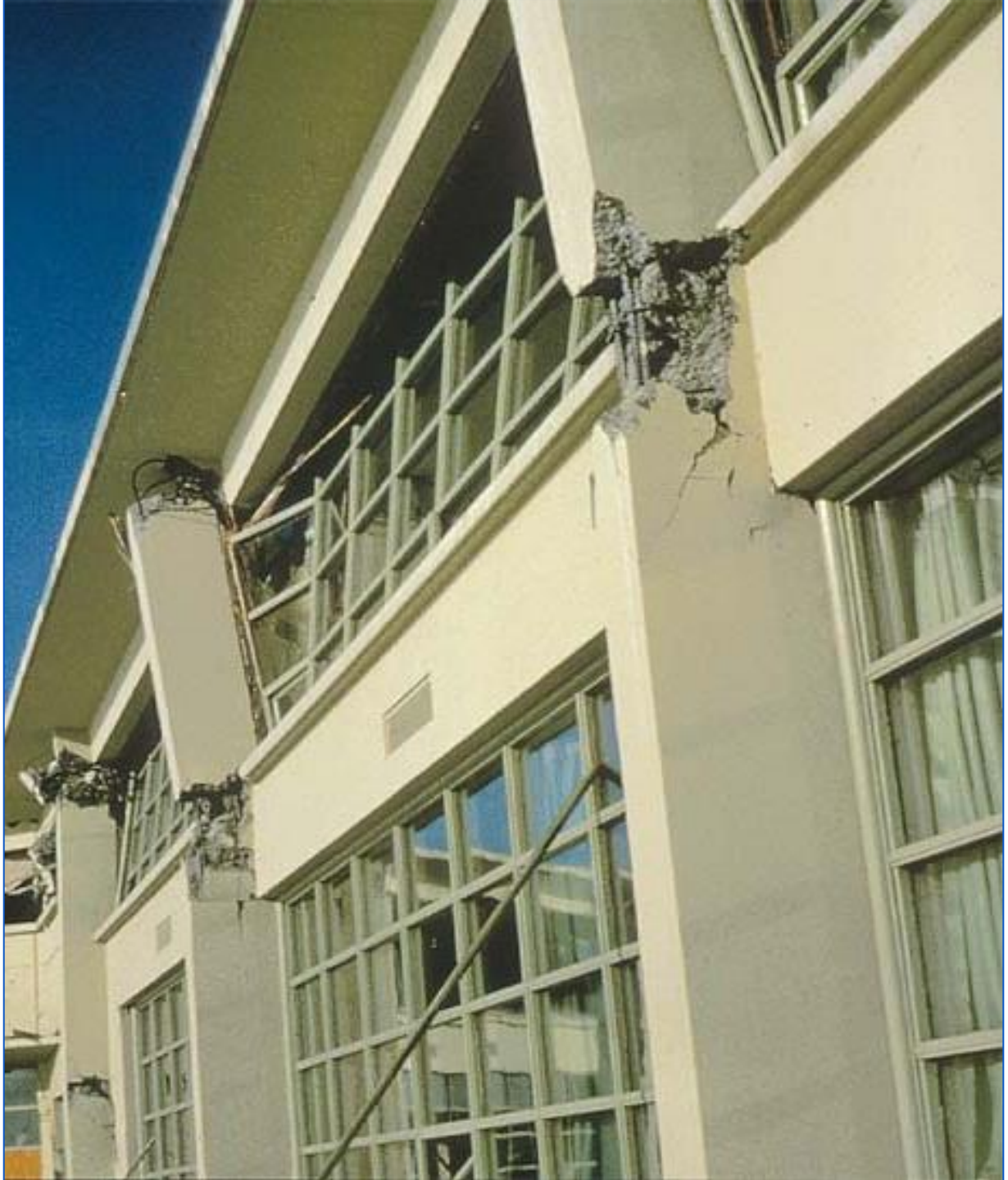
ASCE Chile Reconnaissance Team



ASCE Chile Reconnaissance Team ATC-20

ASCE Chile Reconnaissance Team


CRACKED INFILL WALL
(WITH CRACKS EXTENDING
THROUGH CONCRETE FRAME)
DIAPHRAGM
DISTRESS
RACKING OF CLADDING
PANEL ZONE
CRACKING
BEAM CONCRETE
SPALLING EXPOSURE
OF REINFORCEMENT
COLUMN CONCRETE
SPALLING EXPOSURE
OF REINFORCEMENT
DAMAGED CLADDING
CONNECTIONS
COLUMNS OUT
OF PLUMB
(AT ANY LEVEL)

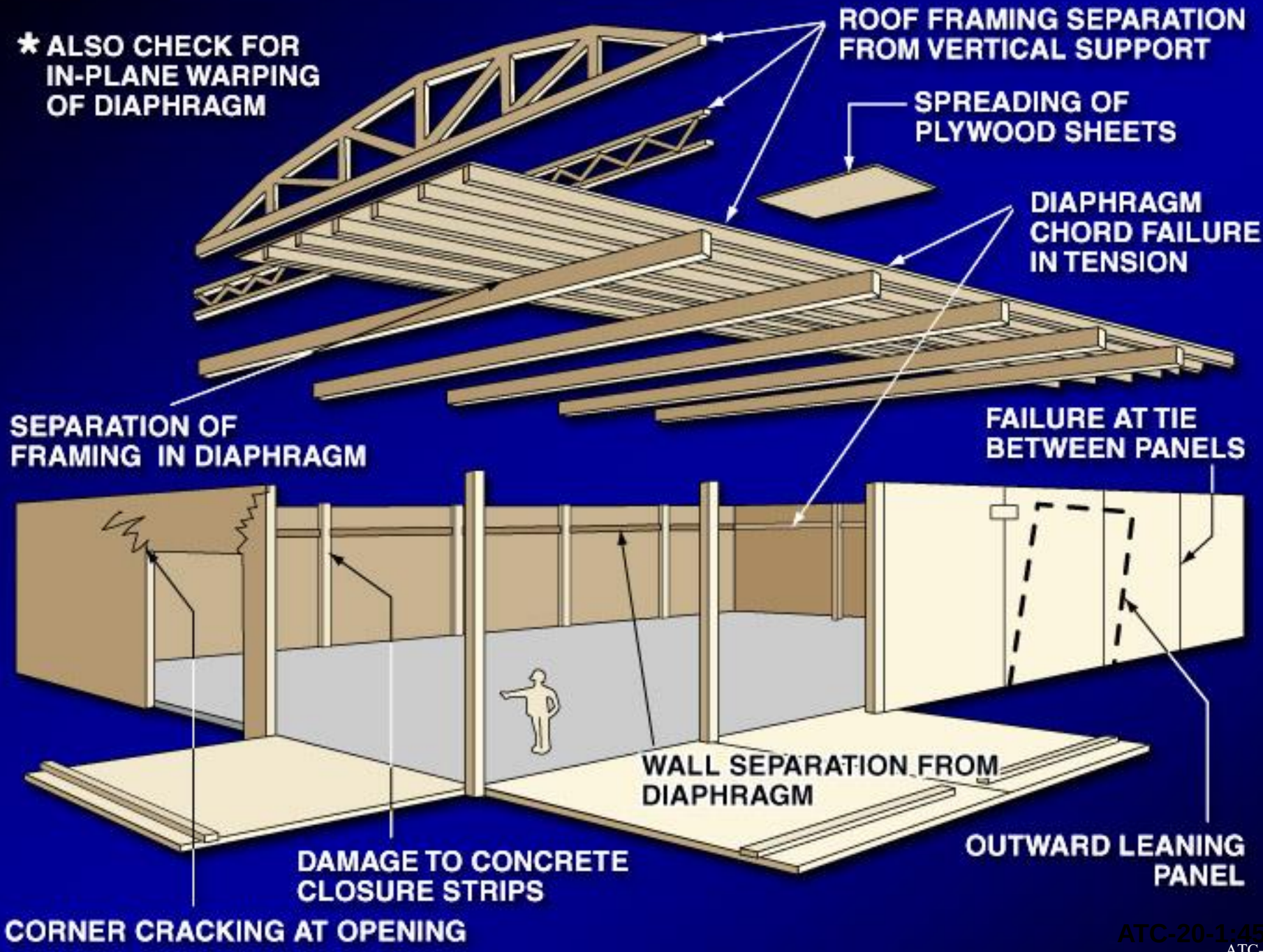


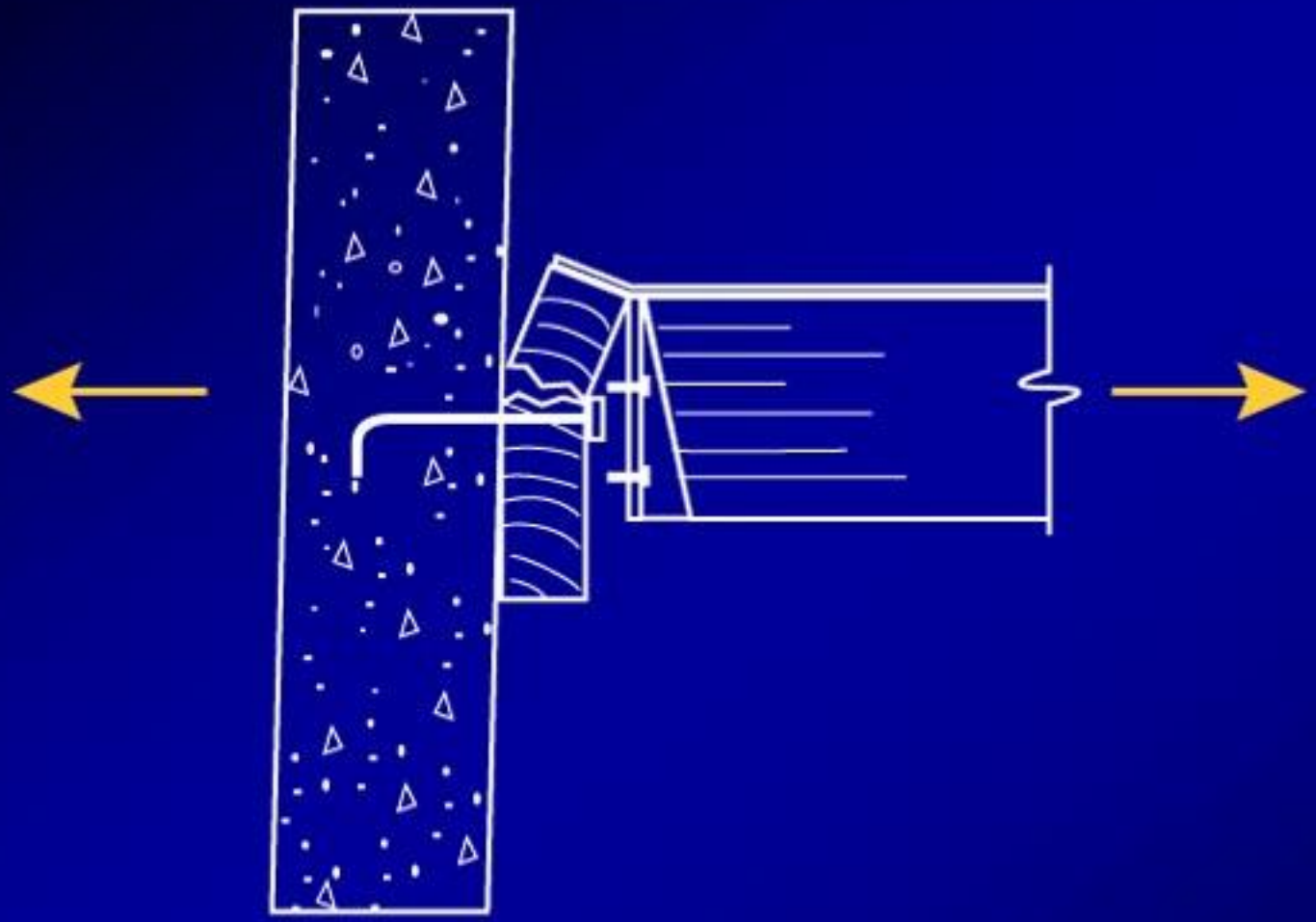

專用
停車位

ATC-20


L'S UNIQUE CREATIONS
OLYMPIC WEST PHARMACY

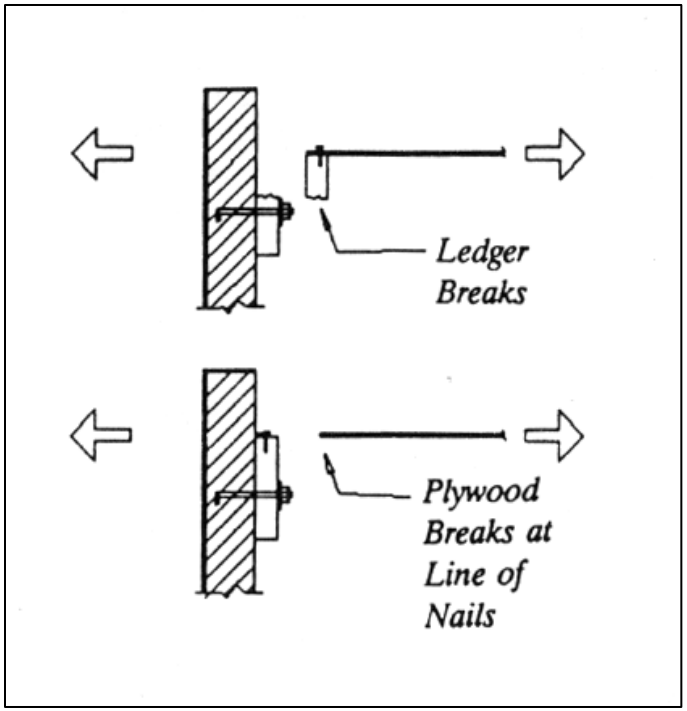

PARKING

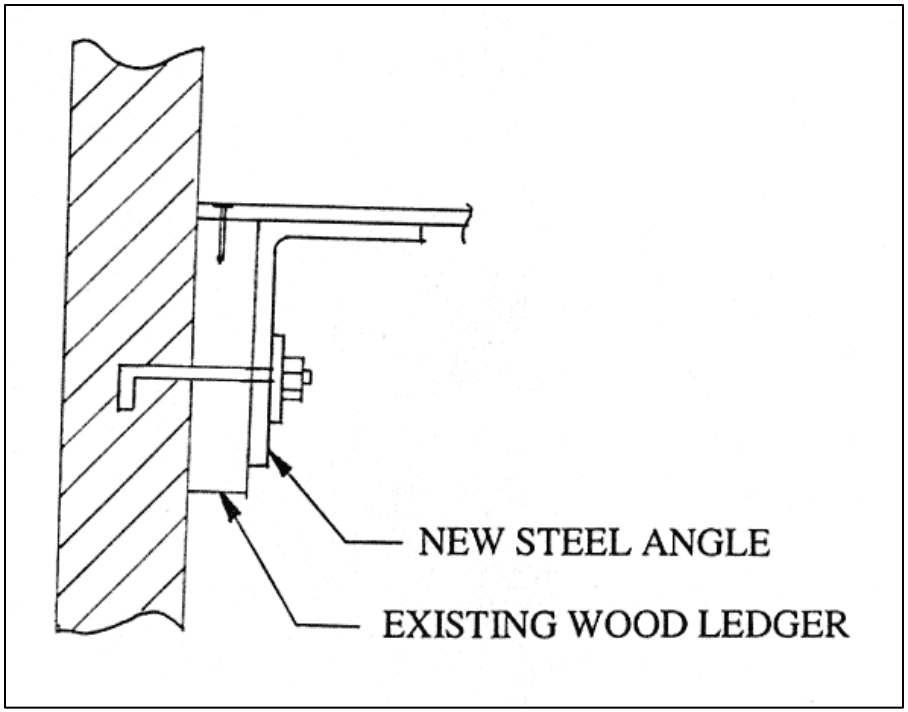

★ ALSO CHECK FOR IN-PLANE WARPING OF DIAPHRAGM
ROOF FRAMING SEPARATION FROM VERTICAL SUPPORT
SPREADING OF PLYWOOD SHEETS
DIAPHRAGM CHORD FAILURE IN TENSION
SEPARATION OF FRAMING IN DIAPHRAGM
FAILURE AT TIE BETWEEN PANELS
WALL SEPARATION FROM DIAPHRAGM
DAMAGE TO CONCRETE CLOSURE STRIPS
OUTWARD LEANING PANEL
CORNER CRACKING AT OPENING



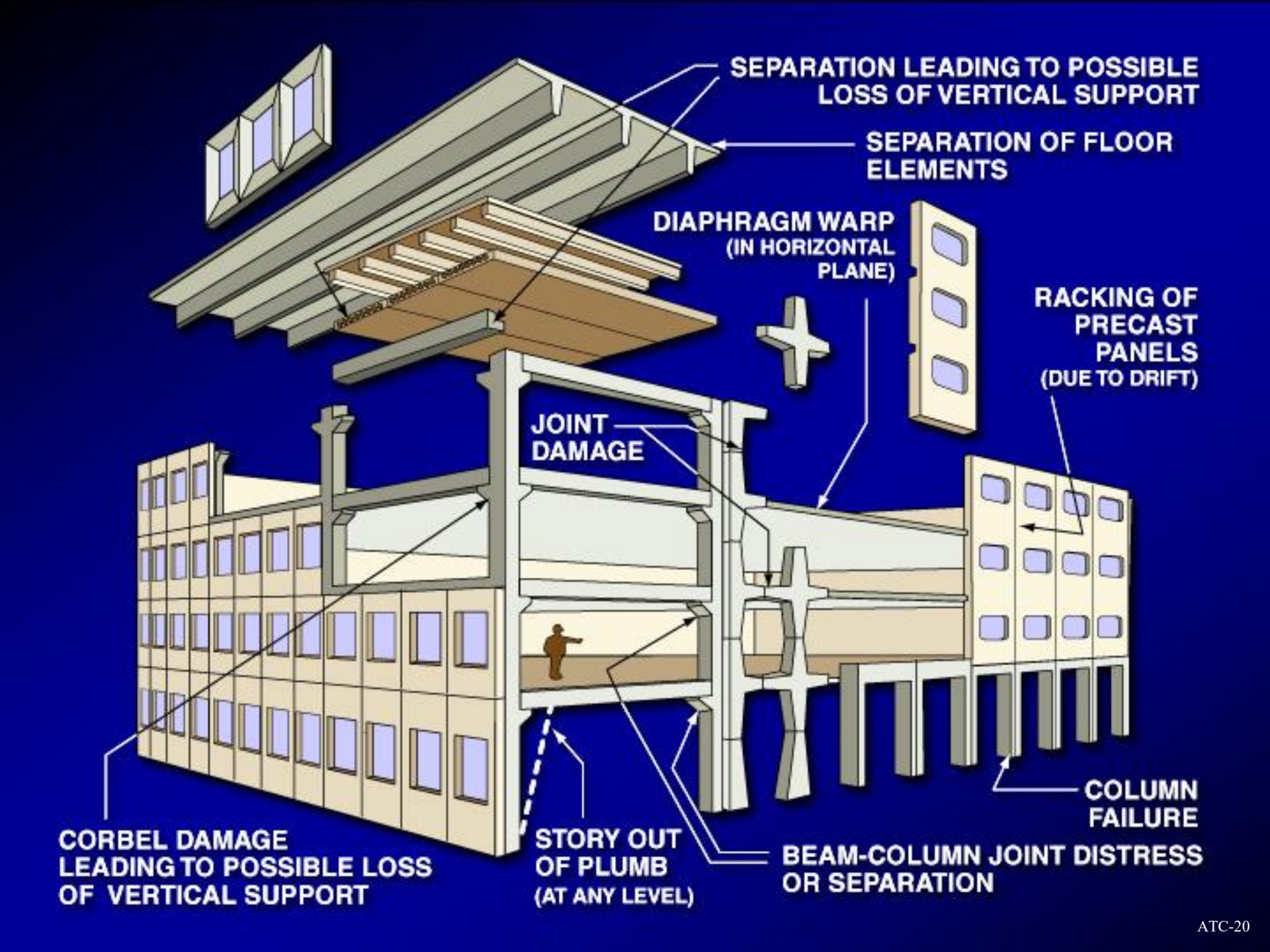
CROSS-GRAIN LEDGER FRACTURE
AT TILT-UP ROOF-TO-WALL CONNECTION

TILT-UP WALL ANCHORAGE



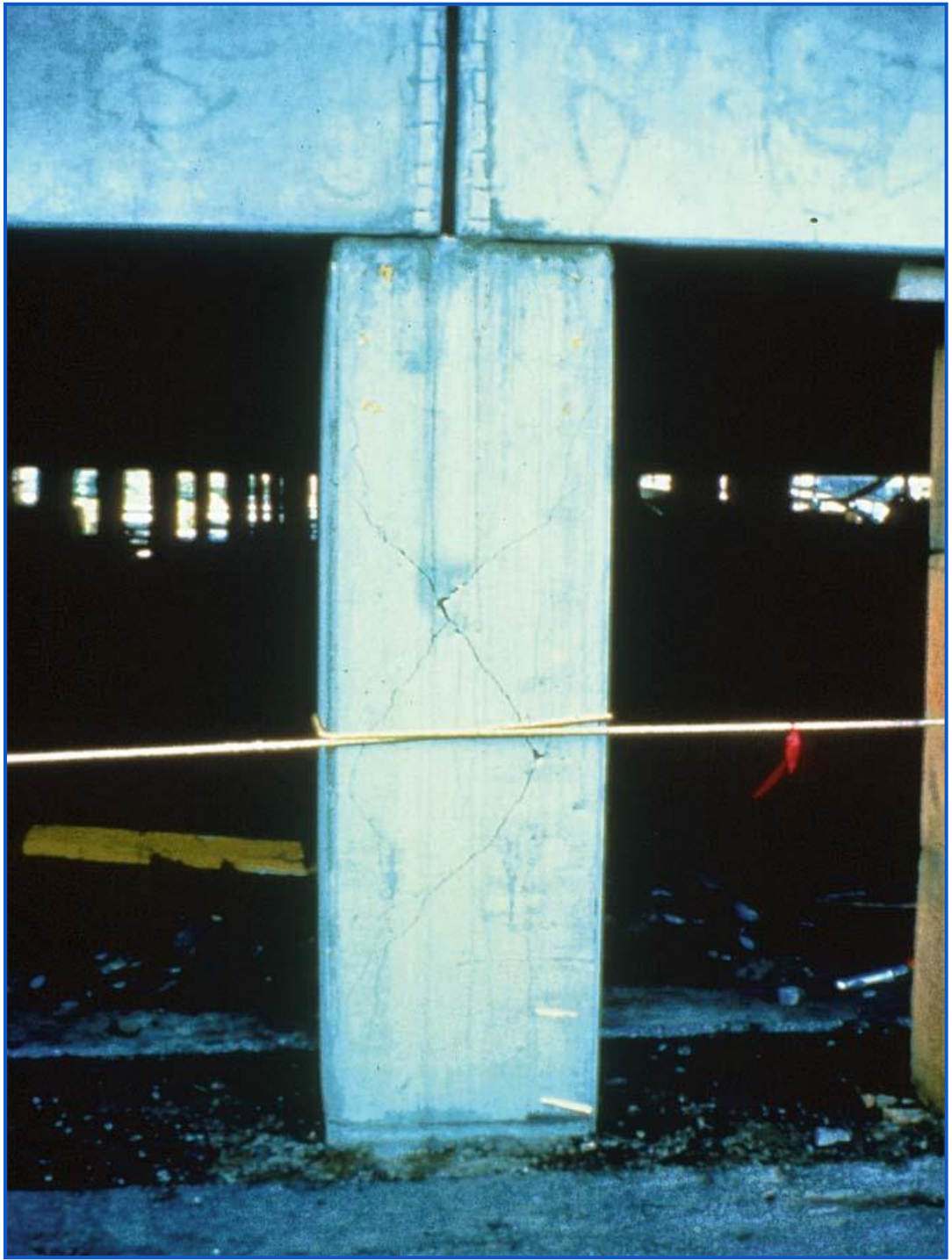



ASCE Chile Reconnaissance Team


SEPARATION LEADING TO POSSIBLE LOSS OF VERTICAL SUPPORT
SEPARATION OF FLOOR ELEMENTS
DIAPHRAGM WARP (IN HORIZONTAL PLANE)
RACKING OF PRECAST PANELS (DUE TO DRIFT)
JOINT DAMAGE
COLUMN FAILURE
CORBEL DAMAGE LEADING TO POSSIBLE LOSS OF VERTICAL SUPPORT
STORY OUT OF PLUMB (AT ANY LEVEL)
BEAM-COLUMN JOINT DISTRESS OR SEPARATION


PRECAST
DOUBLE-T ROOF
MEMBERS


ROBINSONS-MAY



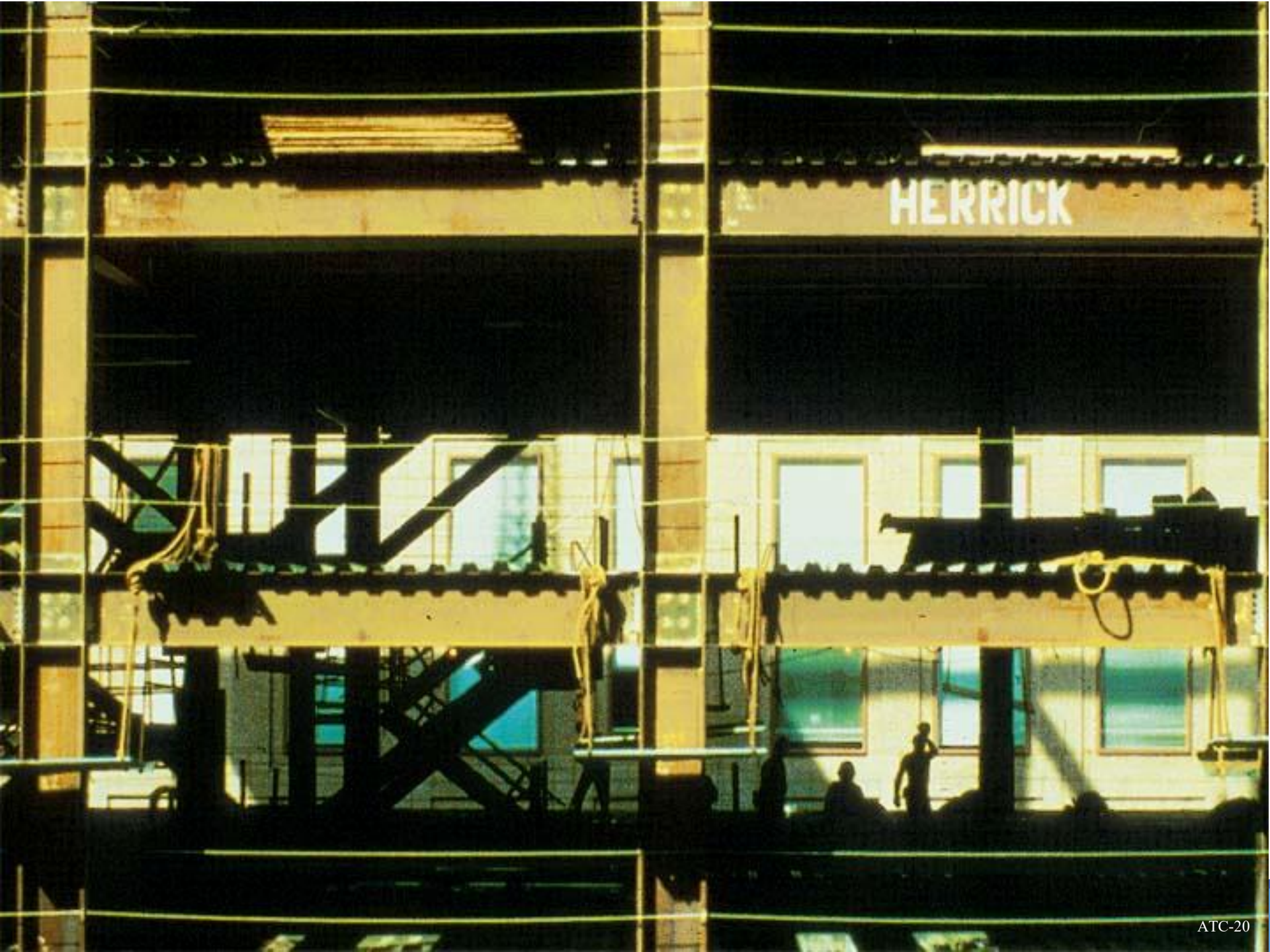
ASCE Chile Reconnaissance Team

STEEL FRAME CONSTRUCTION

STEEL-FRAME CONSTRUCTION

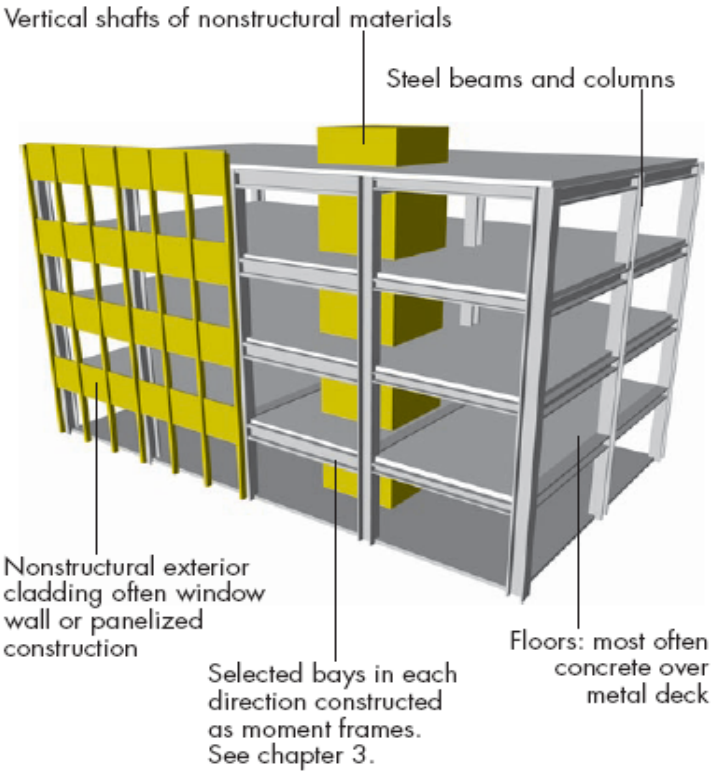
Multi-story fire resistive frame

Pre-engineered light frame


HERRICK

TYPE S1 – STEEL MOMENT FRAMES

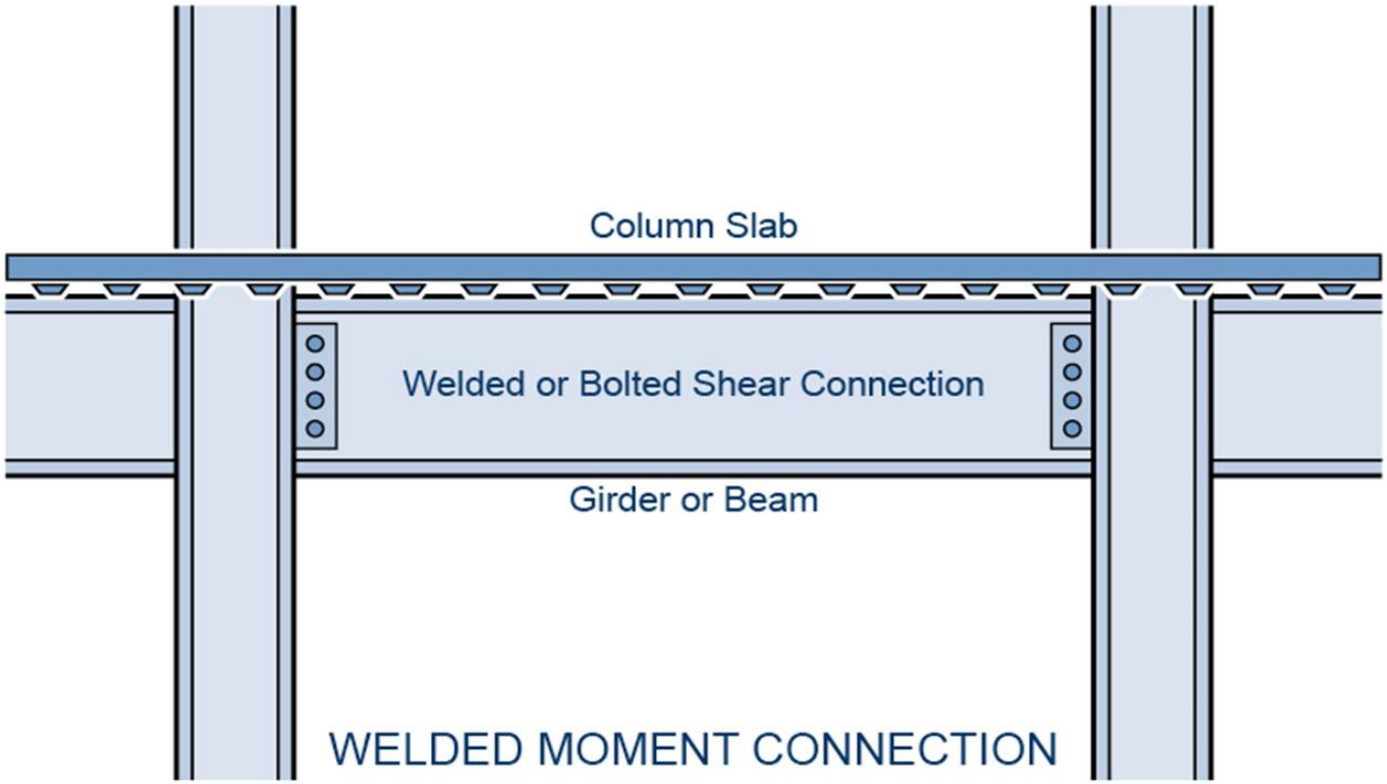
FEMA Building Type S1 STEEL MOMENT FRAMES



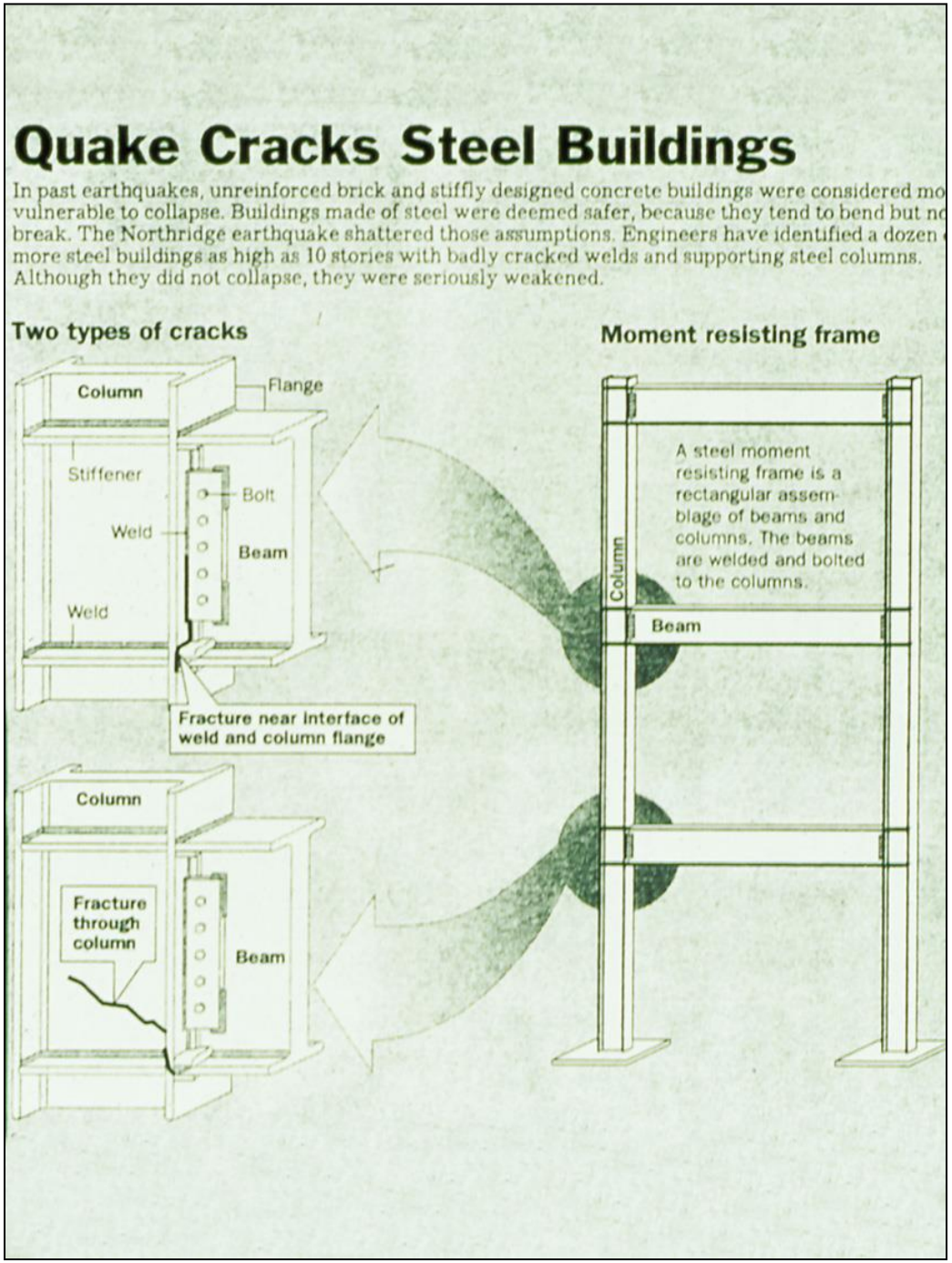
These buildings consist of an essentially complete frame assembly of steel beams and columns. Lateral forces are resisted by moment frames that develop stiffness through rigid connections of the beam and column created by angles, plates and bolts, or by welding. Moment frames may be developed on all framing lines or only in selected bays. It is significant that no structural walls are required. Floors are cast-in-place concrete slabs or metal deck and concrete. This building is used for a wide variety of occupancies such as offices, hospitals, laboratories, and academic and government buildings.

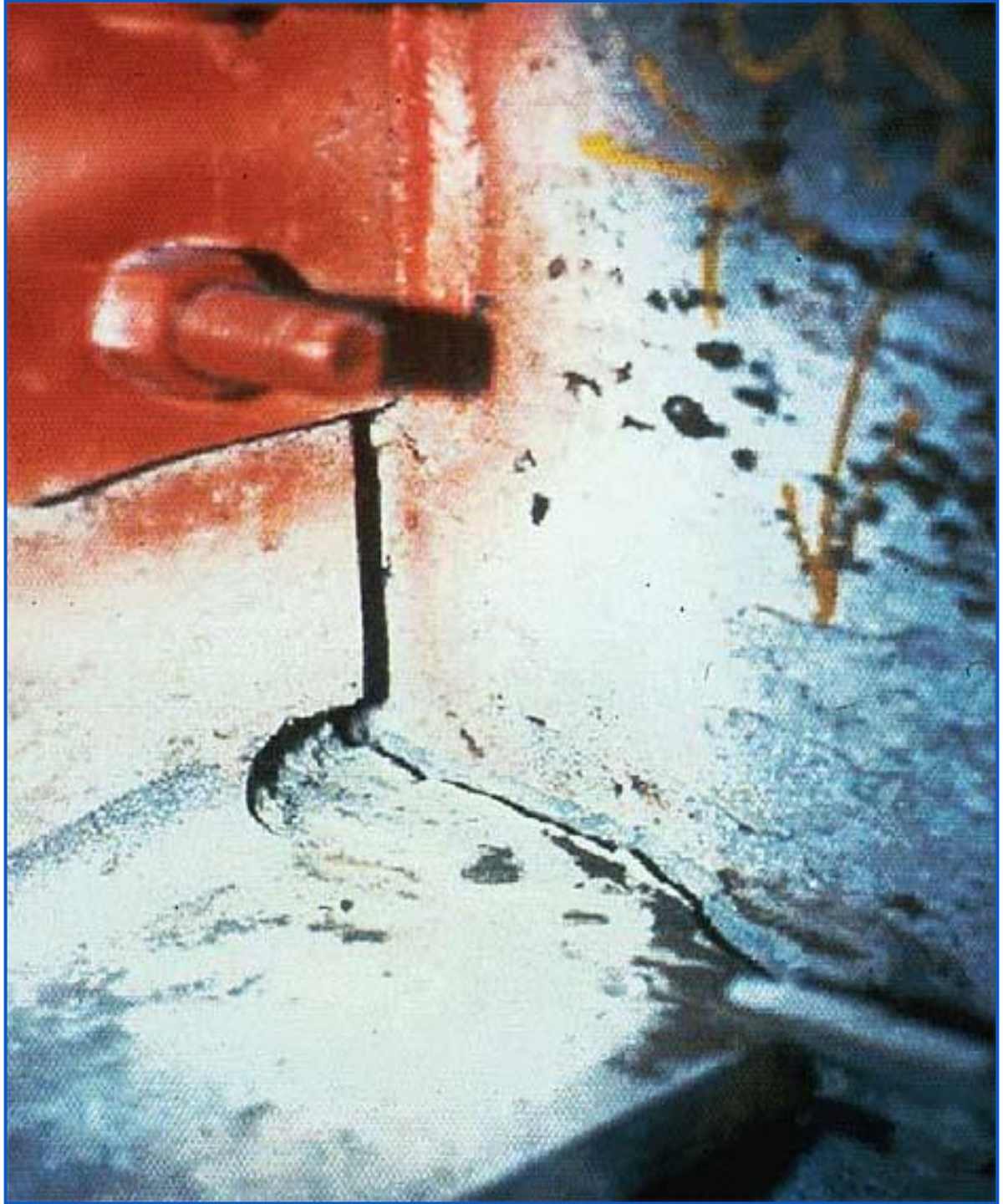
The S1A building type is similar but has floors and roof that act as flexible diaphragms, such as wood or uptopped metal deck. One family of these buildings are older warehouse or industrial buildings, while another more recent use is for small office or commercial buildings in which the fire rating of concrete floors is not needed.

S1 – STEEL MOMENT FRAME



BRITTLE STEEL??



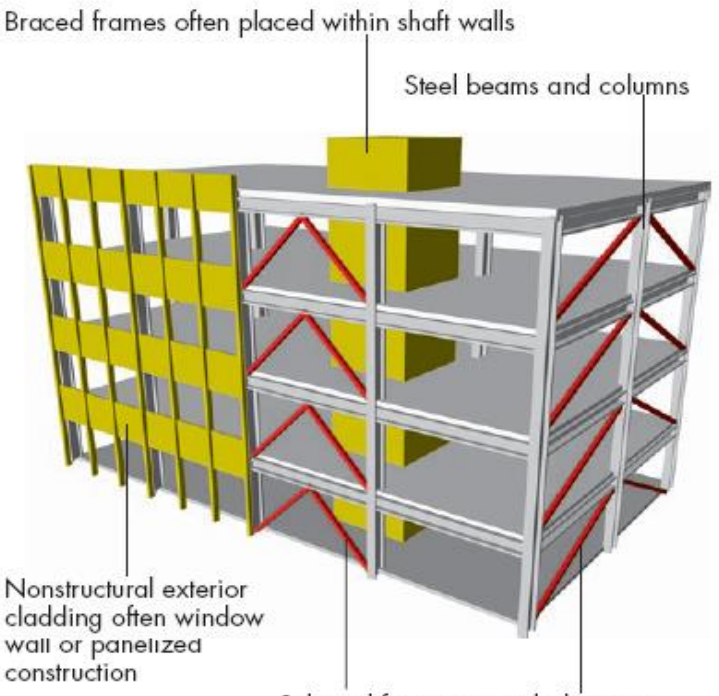



460


15–3–E3–W

TYPE S2 – STEEL BRACED FRAMES

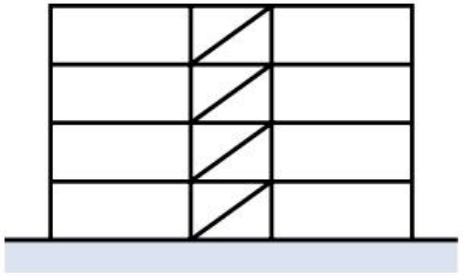
FEMA Building Type S2 STEEL-BRACED FRAMES



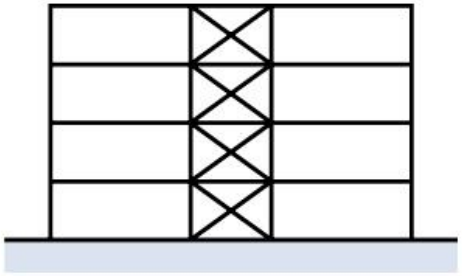
These buildings consist of a frame assembly of steel columns and beams. Lateral forces are resisted by diagonal steel members placed in selected bays. Floors are cast-in-place concrete slabs or metal deck and concrete. These buildings are typically used for buildings similar tos teel-moment frames, although are more often low rise.

The S2A building type is similar but has floors and roof that act as flexible diaphragms such as wood, or uptopped metal deck. This is a relatively uncommon building type and is used mostly for smaller office or commercial buildings in which the fire rating of concrete floor is not needed.

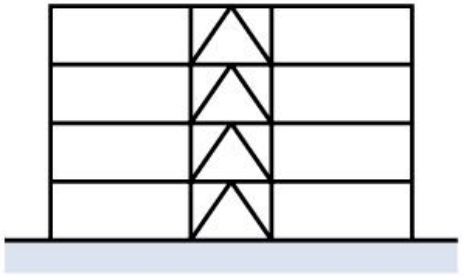
S2 – STEEL BRACED FRAME



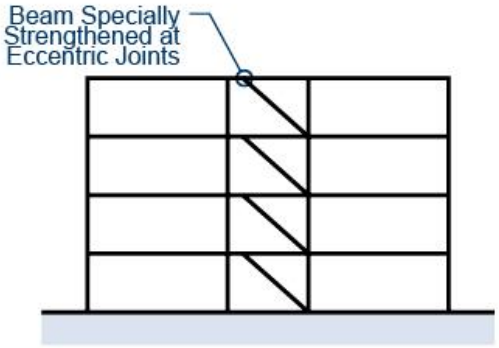
SINGLE DIAGONAL



DOUBLE DIAGONAL

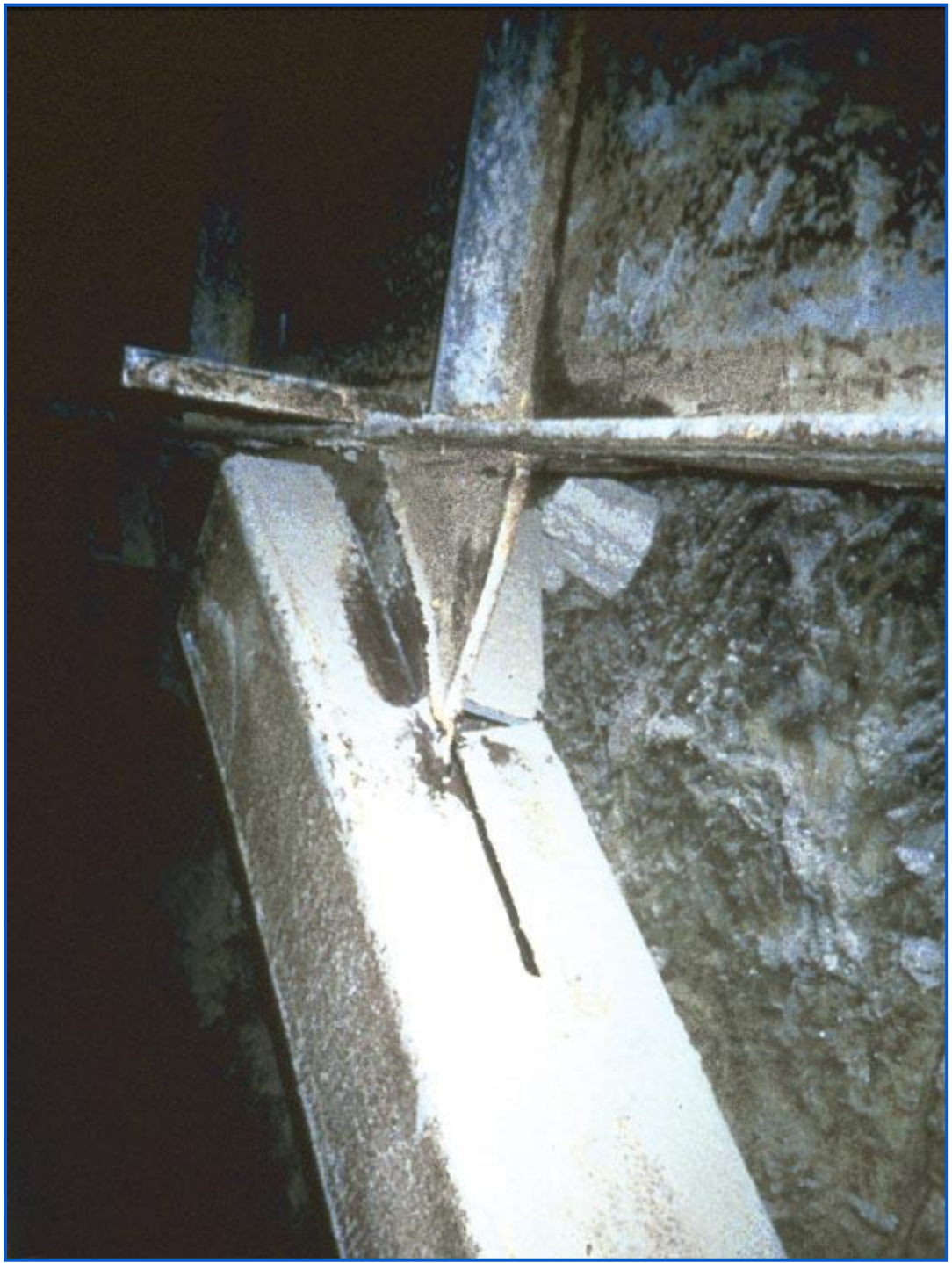


CHEVRON



ECCENTRIC BRACED FRAME

BRITTLE STEEL?



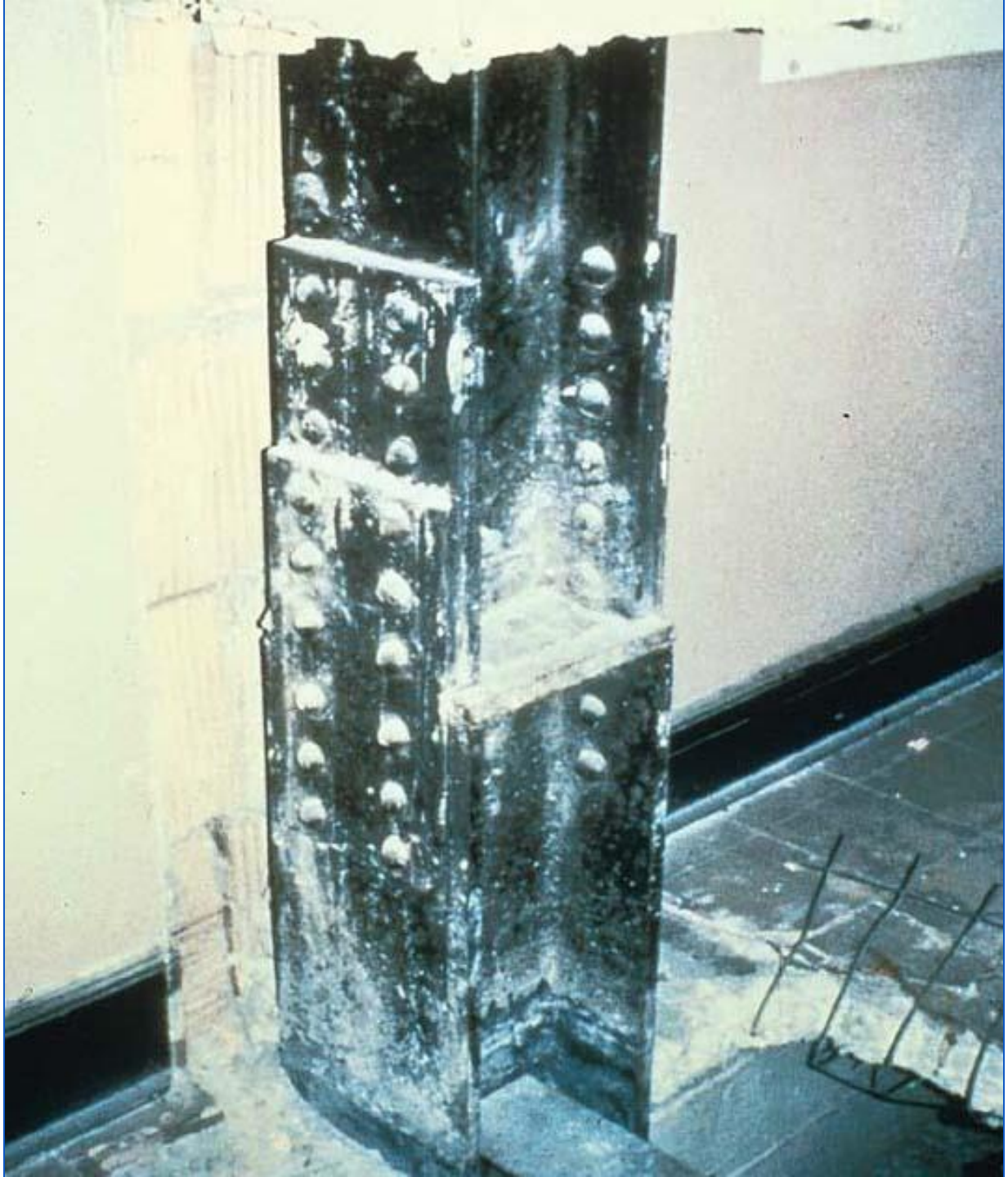

Siu


Siu

SANTIAGO AIRPORT

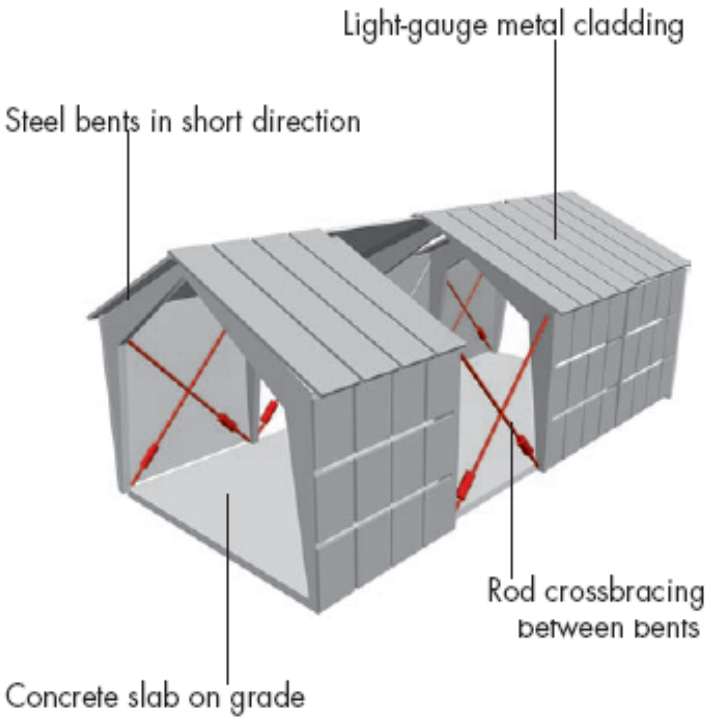
Braced Frame Building

- In-Plane Gusset Plate Buckled
- Perpendicular Gusset Plate Added



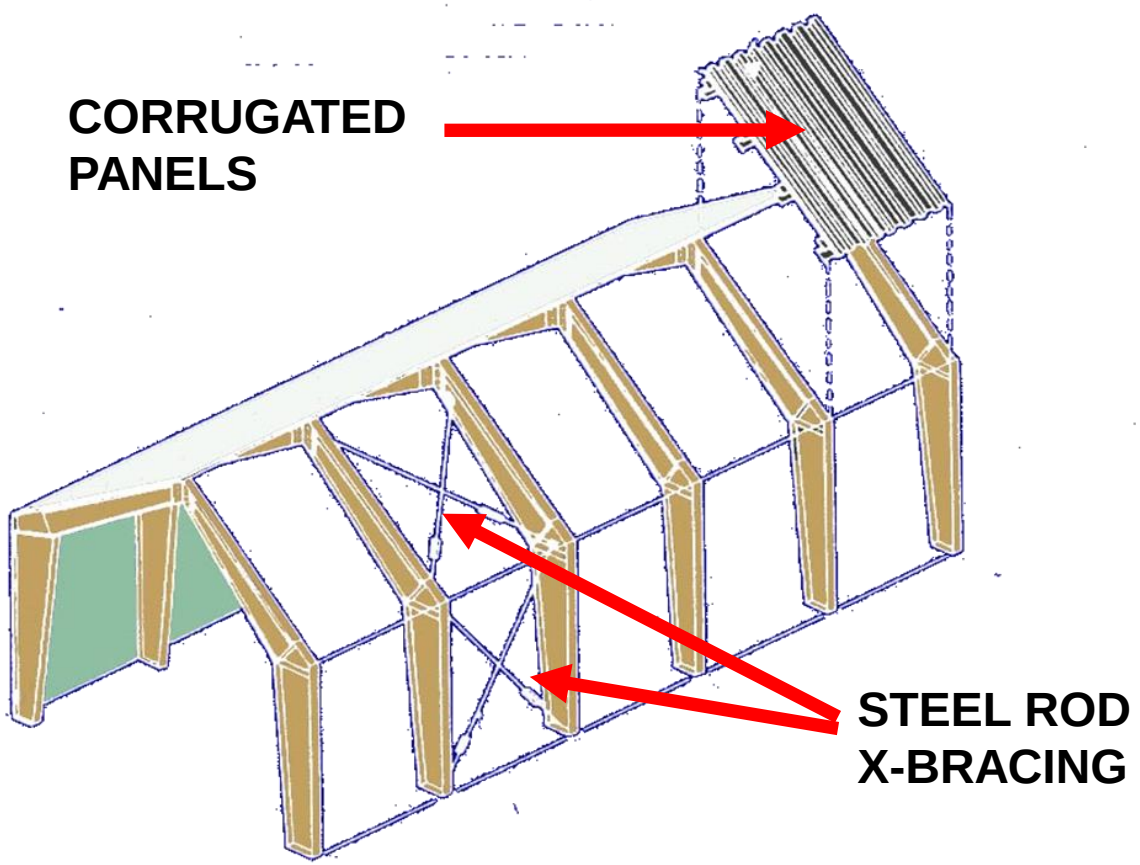
TYPE S3 – STEEL LIGHT FRAMES

FEMA Building Type S3 STEEL LIGHT FRAMES



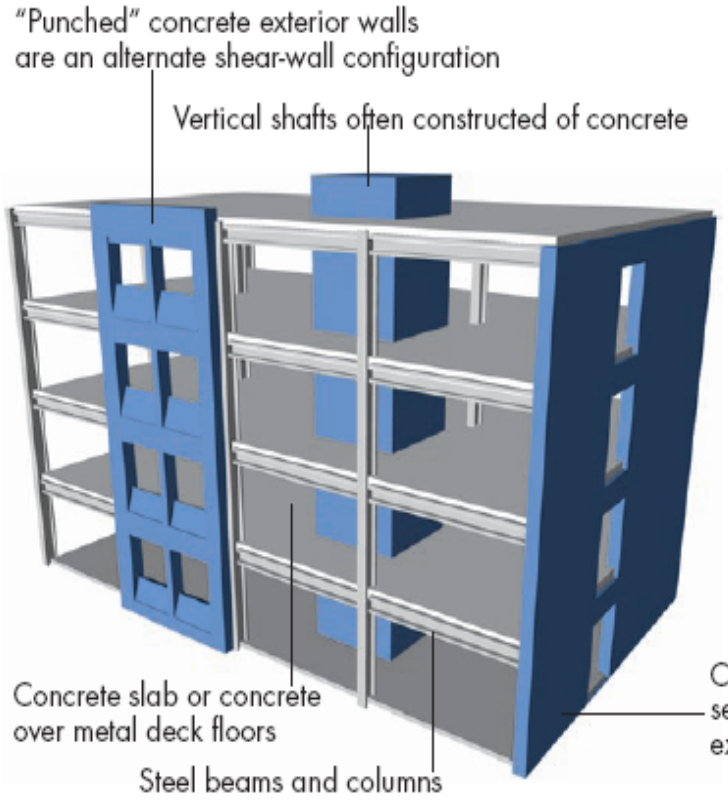
These buildings are one story, pre-engineered and partially prefabricated, and normally consist of transverse steel bents and light purlins. The roof and walls consist of lightweight metal, fiberglass, or cementitious panels. Lateral forces are resisted by the transverse steel bents acting as moment frames, and light rod diagonal bracing in the longitudinal direction. The roof diaphragm is either metal deck or diagonal rod bracing. These buildings are mostly used for industrial or agricultural occupancies.

S3 – STEEL LIGHT FRAME



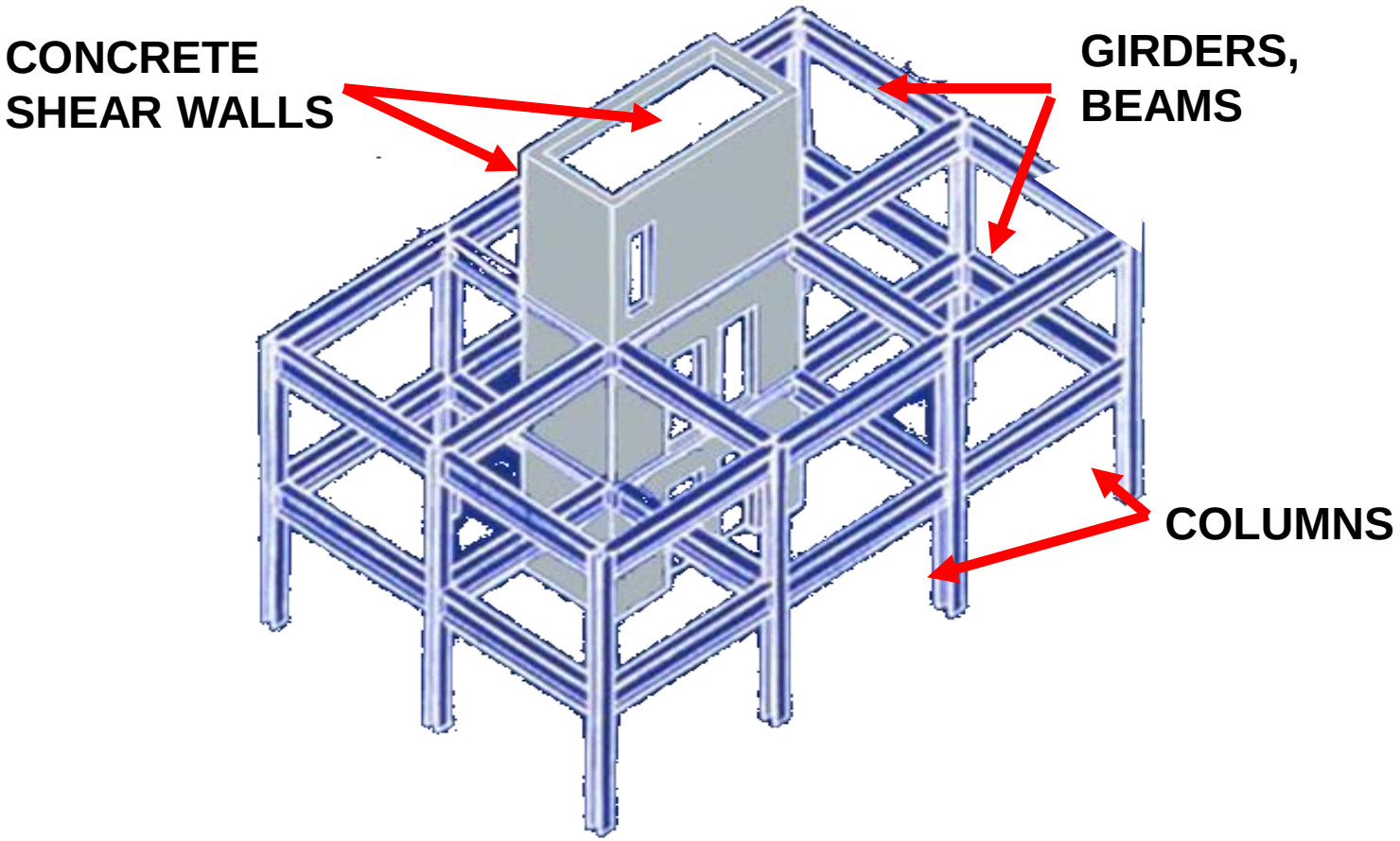
TYPE S4 – STEEL FRAMES W/ CONCRETE SHEAR WALLS

FEMA Building Type S4 STEEL FRAMES with concrete shearwalls



These buildings consist of an essentially complete frame assembly of steel beams and steel columns. The floors are concrete slabs or concrete fill over metal deck. The buildings feature a significant number of concrete walls effectively acting as shear walls, either as vertical transportation cores, isolated in selected bays, or as a perimeter wall system. The steel column-and-beam system may act only to carry gravity loads or may have rigid connections to act as a moment frame. This building type is generally used as an alternate for steel moment or braced frames in similar circumstances. These buildings will usually be mid- or low-rise.

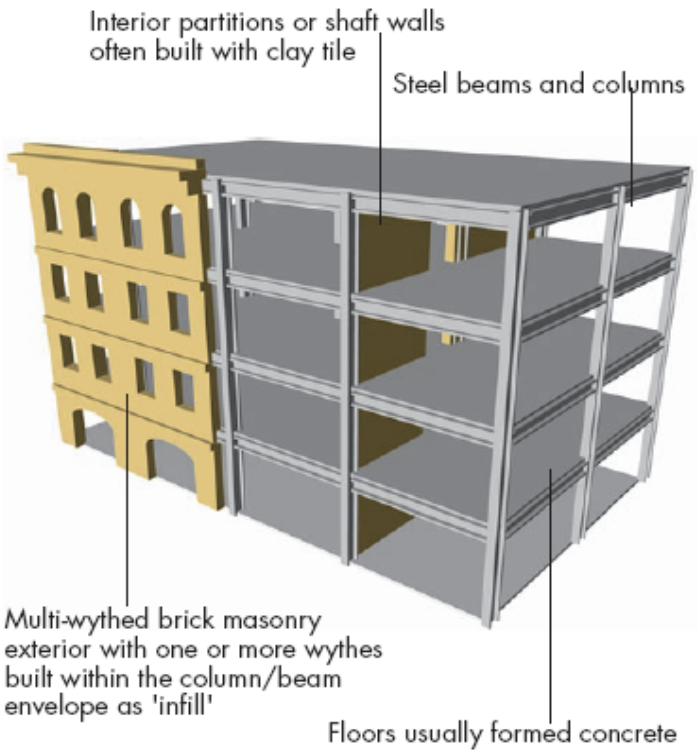
S4 – STEEL FRAME W/ CONCRETE SHEAR WALLS




CRACKED CONCRETE
WALL AT INTERIOR
ELEVATOR CORE

TYPE S5 – STEEL FRAME W/ MASONRY INFILL WALLS

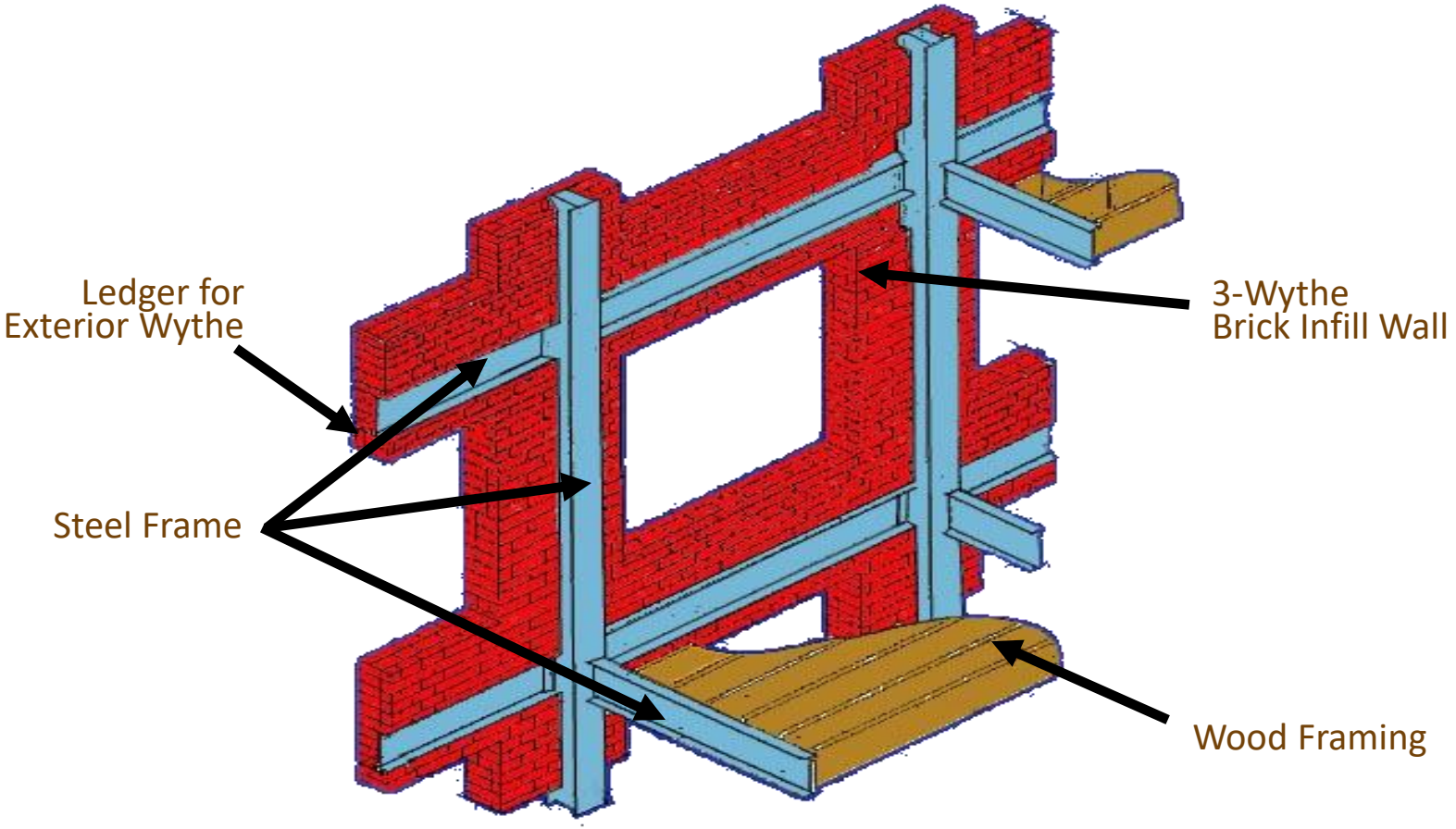
FEMA Building Type S5 STEEL FRAMES with infill masonry walls



This is normally an older building that consists of an essentially complete frame assembly of steel floor beams or trusses and steel columns. The floor consists of masonry flat arches, concrete slabs or metal deck, and concrete fill. Exterior walls and possibly some interior walls, are constructed of unreinforced solid clay brick, concrete block, or hollow-clay tile masonry infilling the space between columns and beams. Windows and doors may be present in the infill walls, but to act effectively as shear-resisting elements, the infill masonry must be constructed tightly against the columns and beams. Although relatively modern buildings in moderate or low seismic regions are built with unreinforced masonry exterior infill walls, the walls are generally not built tight against the beams and columns and therefore do not provide shear resistance. The buildings intended to fall into this category feature exposed clay brick masonry on the exterior and are common in commercial areas of cities with occupancies of retail stores, small offices, and hotels.

The S5A building type is similar but has floors and roof that act as flexible diaphragms, such as wood or uptopped metal deck. These buildings will almost all date to the 1930s and earlier, and were originally warehouses or industrial buildings.

S5 – STEEL FRAME W/ URM INFILL



MANUFACTURED HOMES

DAMAGE TO MANUFACTURED HOMES

Off their piers, blocks, or jack stands either partially or totally

Piers penetrating the interior floor decking

Fully or partially burned

Energizing of metal skin in older units

DAMAGE TO MANUFACTURED HOMES

Utilities damaged and turned off

Water heater movement effecting venting and/or gas supply

Damage to accessories

Displaced sewer connections

MANUFACTURED HOME EVALUATION PROCEDURES

Stability of the jack stands;

Safety of accessories, awnings, etc;

Condition of utilities;

Home ingress and egress, and

Geotechnical.

Example of a well-worn jack stand used to support manufactured home.

NON-STRUCTURAL ELEMENTS

NONSTRUCTURAL ELEMENTS

Parapets, chimneys, ornamentation

Cladding and glazing

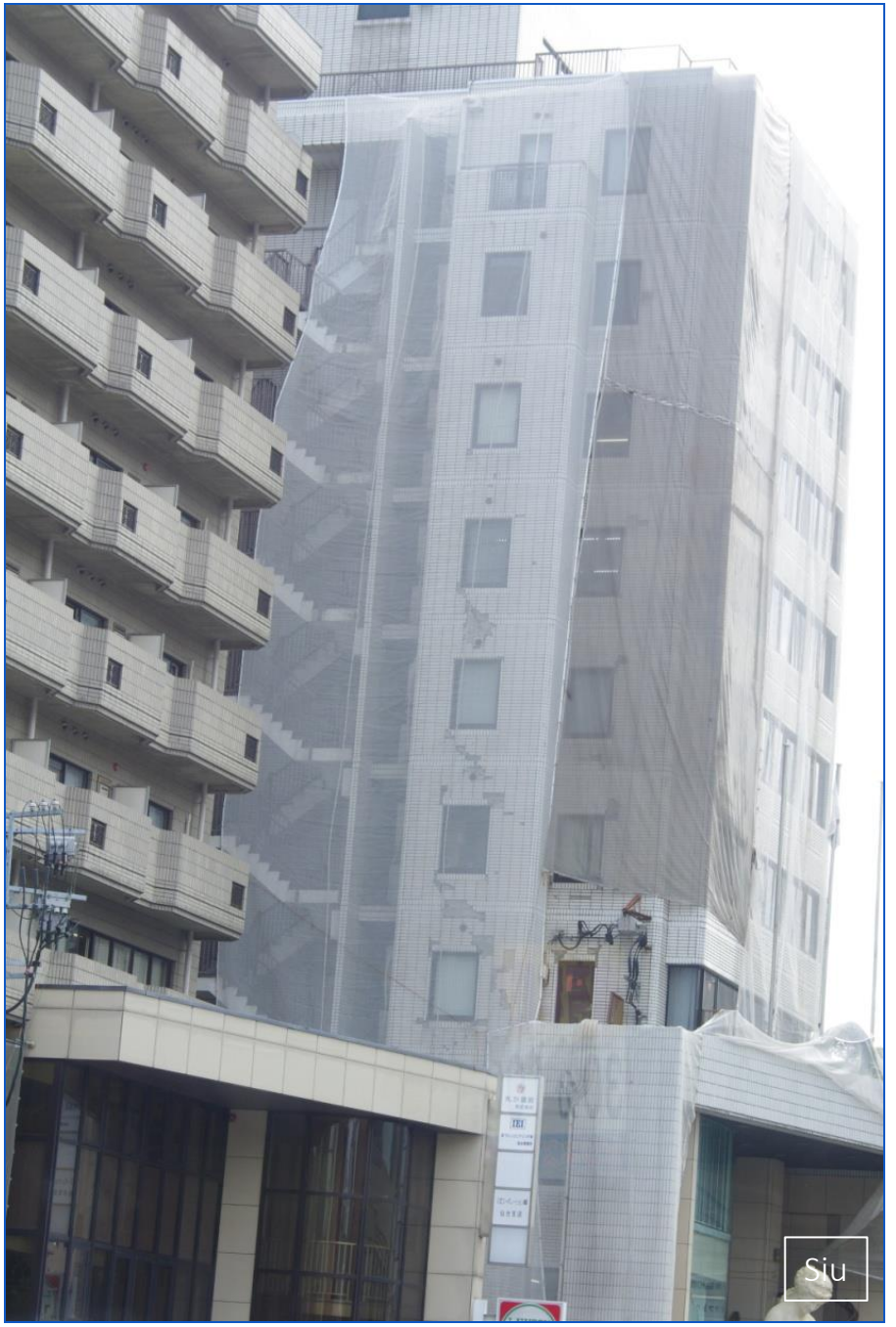
Partitions

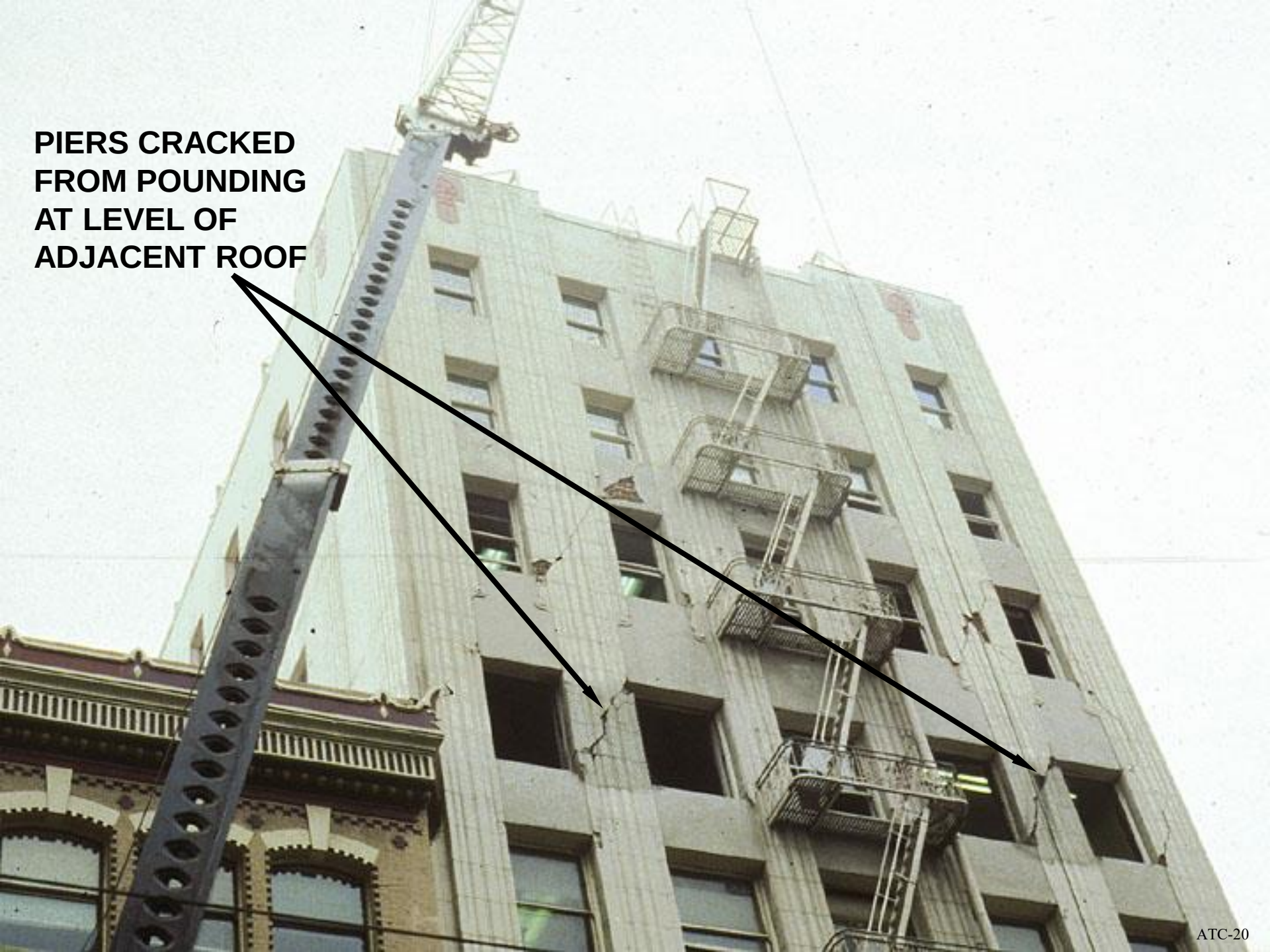
Suspended ceilings, raised floors

Tanks, piping, and ductwork

Equipment, furnishings


Siu


Siu

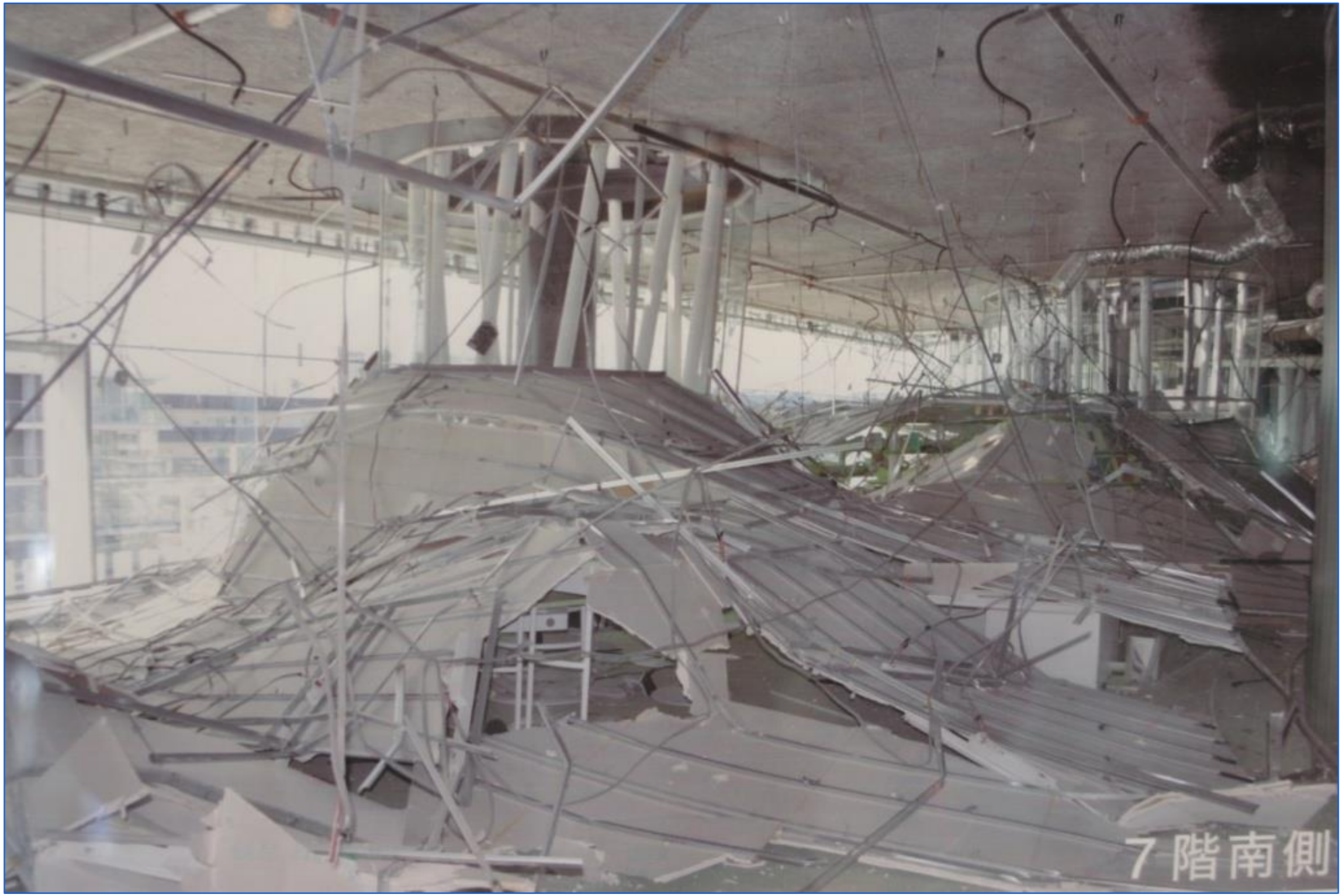

PIERS CRACKED
FROM POUNDING
AT LEVEL OF
ADJACENT ROOF

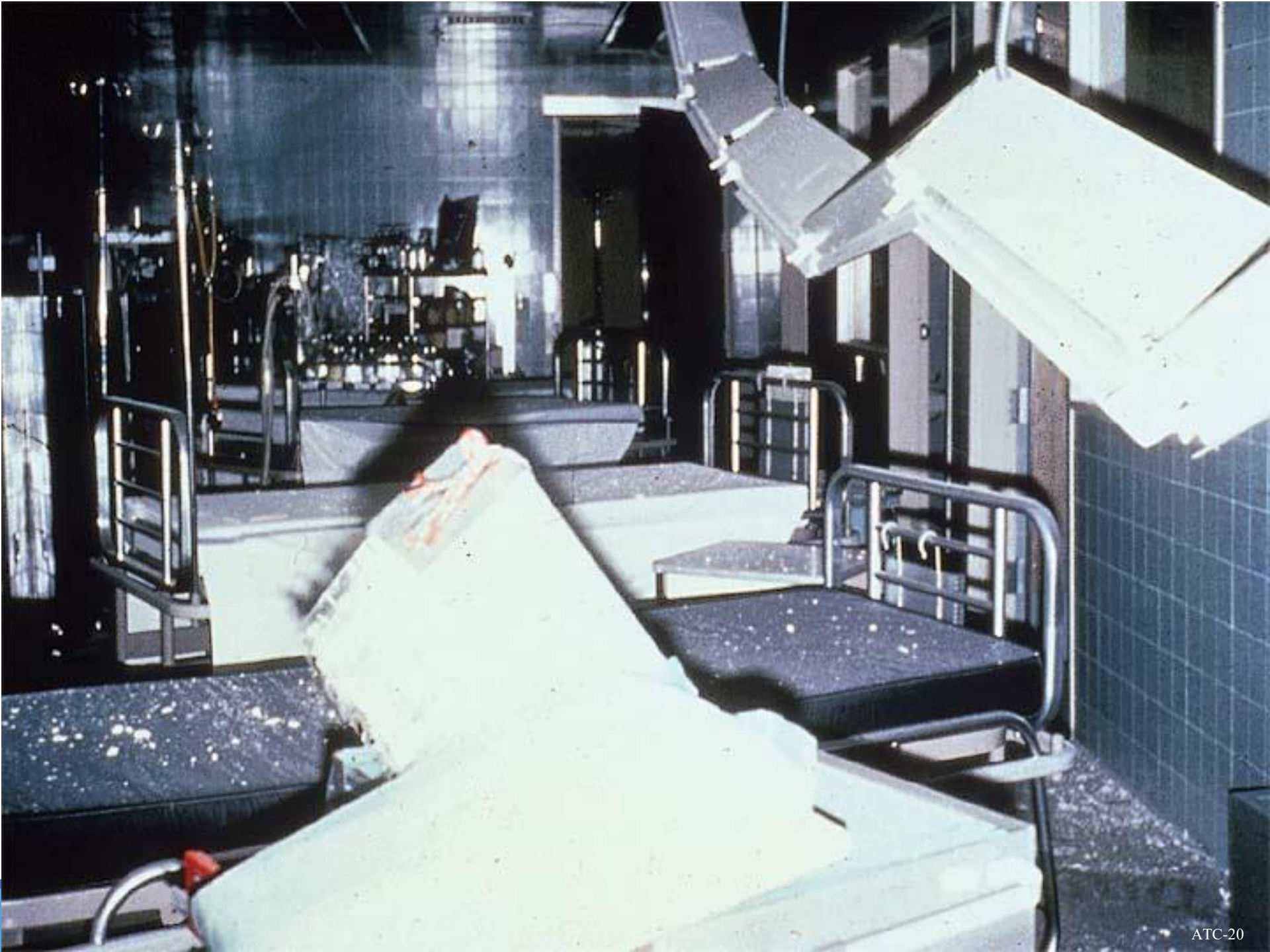

DISLODGED CLAY
ROOF TILES CREATE
A FALLING HAZARD
MANDARIN
CHINESE CUISINE
SPECIAL
ALL YOU —
— CAN EAT
BUFFET
LUNCH
& Salad Bar
MONDAY
thru FRIDAY
11:30 a.m. - 2:30 p.m.


Pfeiffer

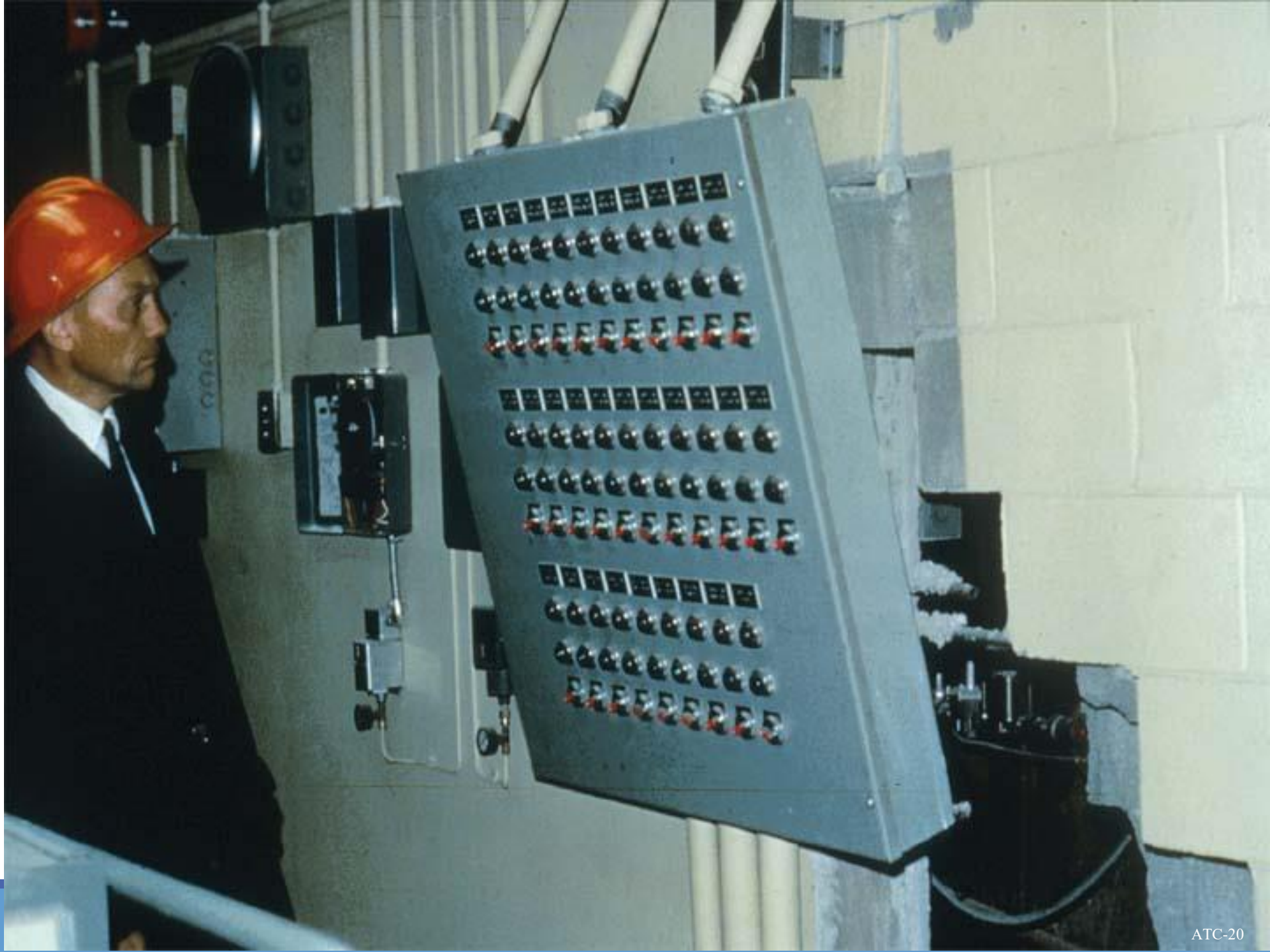
Photos from EERI Seminar, Seismic Design and Performance of Nonstructural Elements

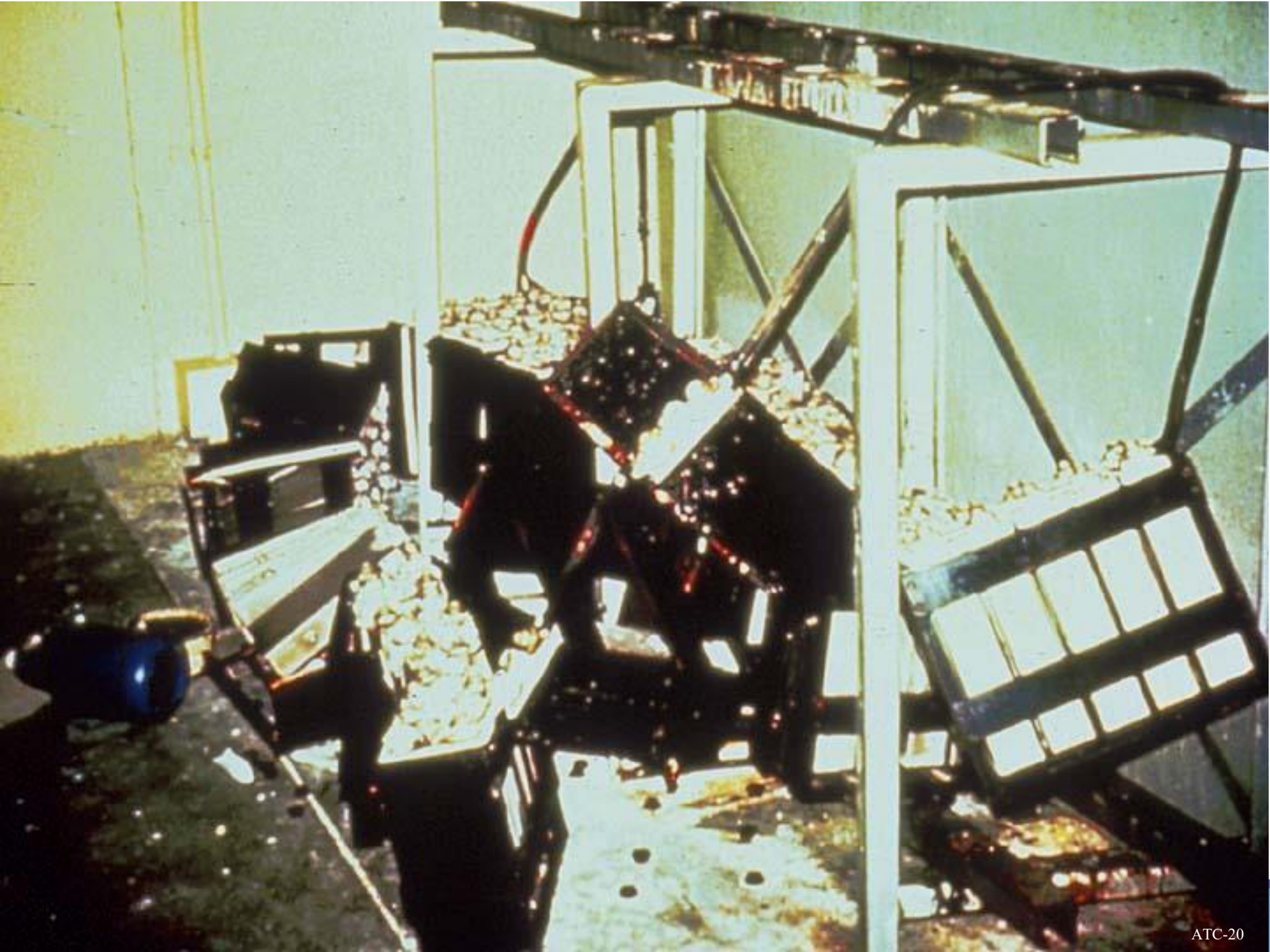

2


7階南側



ATC-20





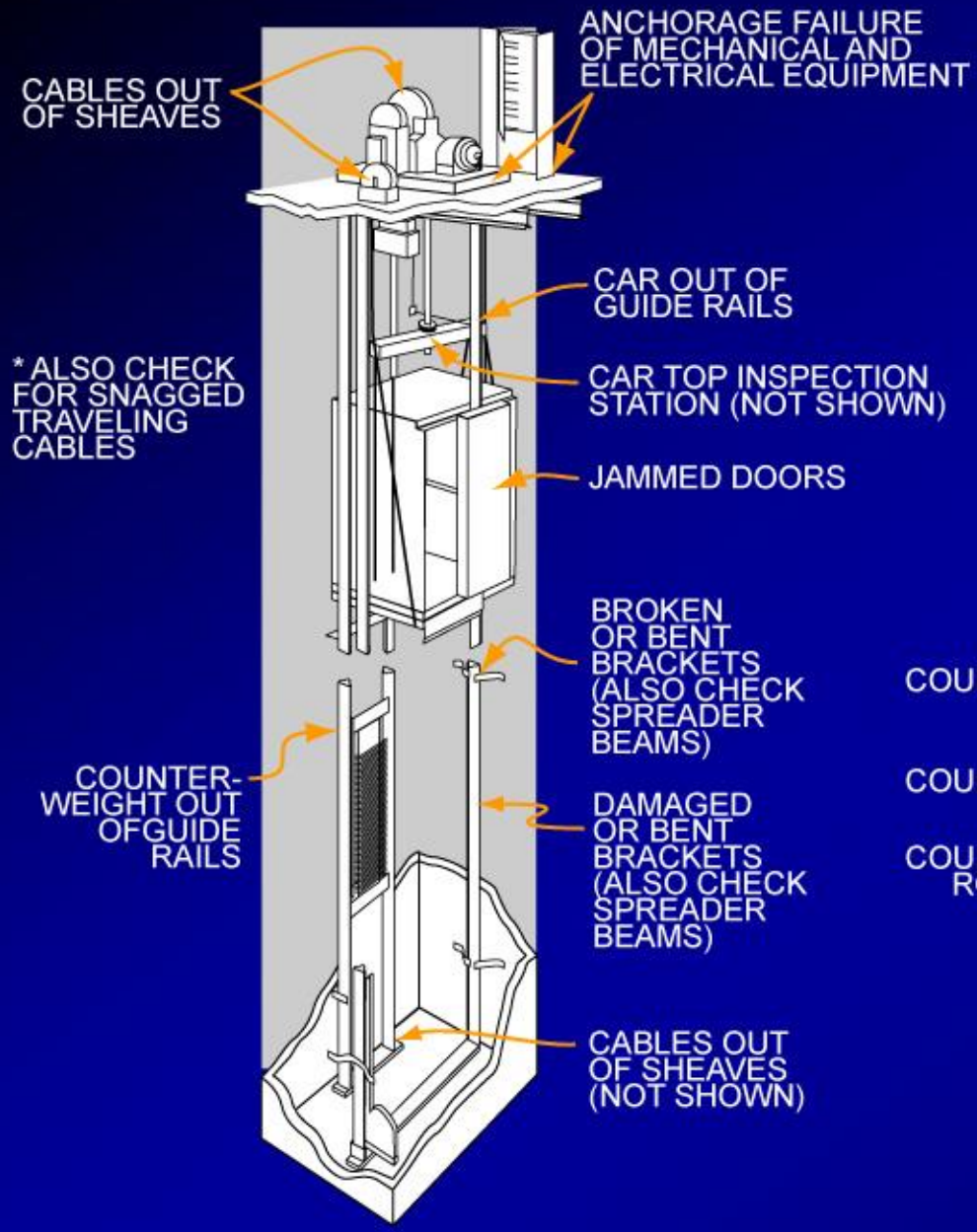
ATC-20

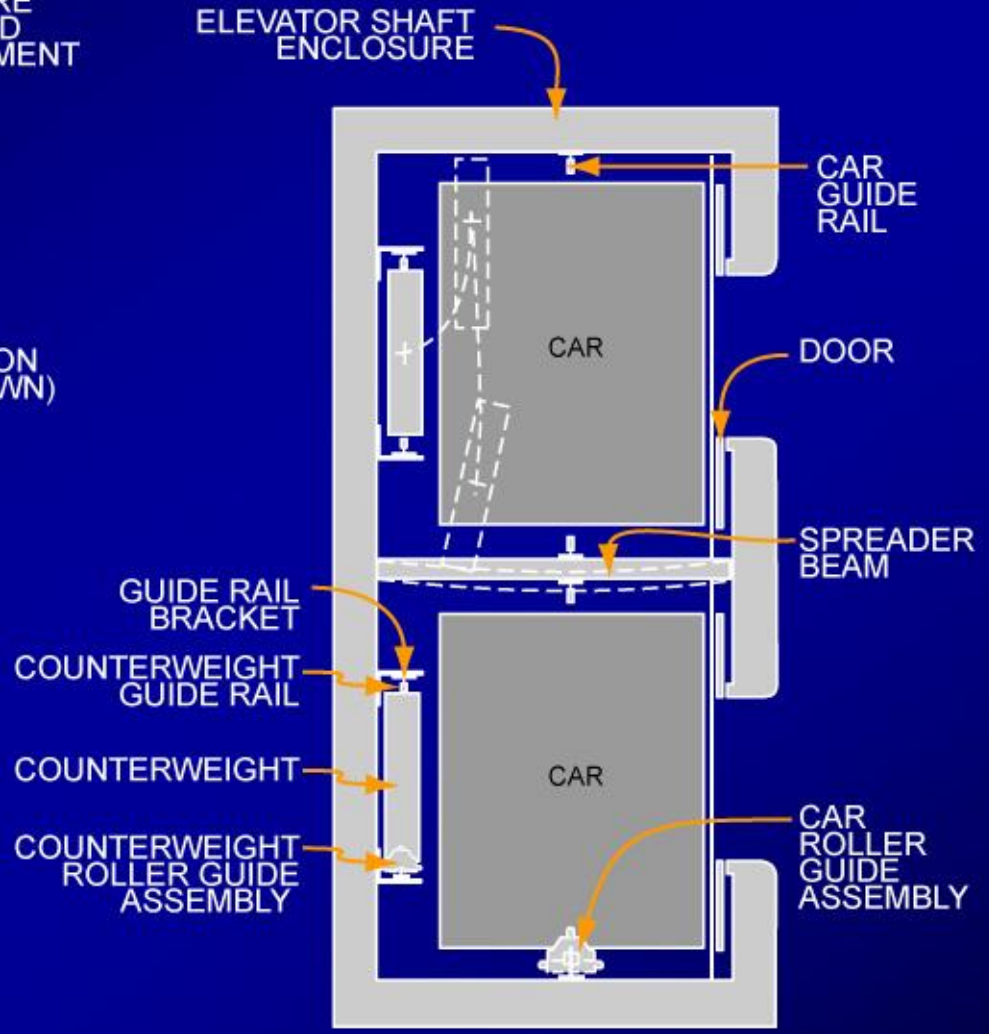

"ELEPHANT'S FOOT" BUCKLING AT BASE OF LIQUID STORAGE TANK


LACK OF BOLTED
CONNECTION BETWEEN
EQUIPMENT AND
SUPPORT PLATFORM


PIPE FLANGE
FAILURE CAUSED
BY EARTHQUAKE
LATERAL FORCES

Seattle Public Utilities


CABLES OUT OF SHEAVES
ANCHORAGE FAILURE OF MECHANICAL AND ELECTRICAL EQUIPMENT
CAR OUT OF GUIDE RAILS
* ALSO CHECK FOR SNAGGED TRAVELING CABLES
CAR TOP INSPECTION STATION (NOT SHOWN)
JAMMED DOORS
BROKEN OR BENT BRACKETS (ALSO CHECK SPREADER BEAMS)
COUNTER-WEIGHT OUT OFGUIDE RAILS
DAMAGED OR BENT BRACKETS (ALSO CHECK SPREADER BEAMS)
CABLES OUT OF SHEAVES (NOT SHOWN)


ELEVATOR SHAFT ENCLOSURE
CAR GUIDE RAIL
CAR
DOOR
SPREADER BEAM
GUIDE RAIL BRACKET
COUNTERWEIGHT GUIDE RAIL
COUNTERWEIGHT
CAR
COUNTERWEIGHT ROLLER GUIDE ASSEMBLY
CAR ROLLER GUIDE ASSEMBLY

GEOTECHNICAL HAZARDS

GEOTECHNICAL HAZARDS

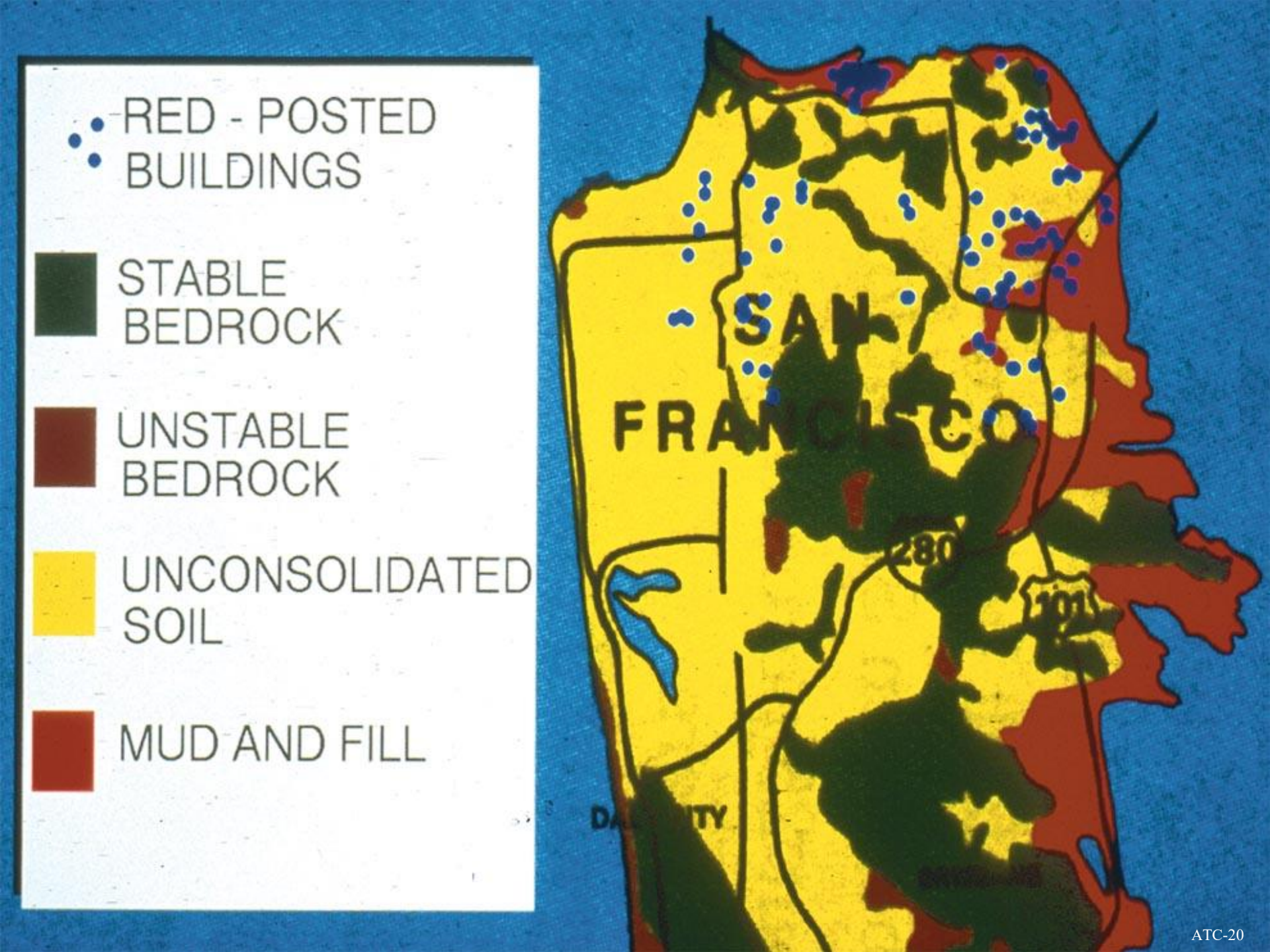
Increased shaking

Fault rupture

Basin amplification

Liquefaction/Lateral spreading

Landslides


RED - POSTED BUILDINGS
STABLE BEDROCK
UNSTABLE BEDROCK
UNCONSOLIDATED SOIL
MUD AND FILL
SAN
280
101

FAULT RUPTURE

BASIN AMPLIFICATION

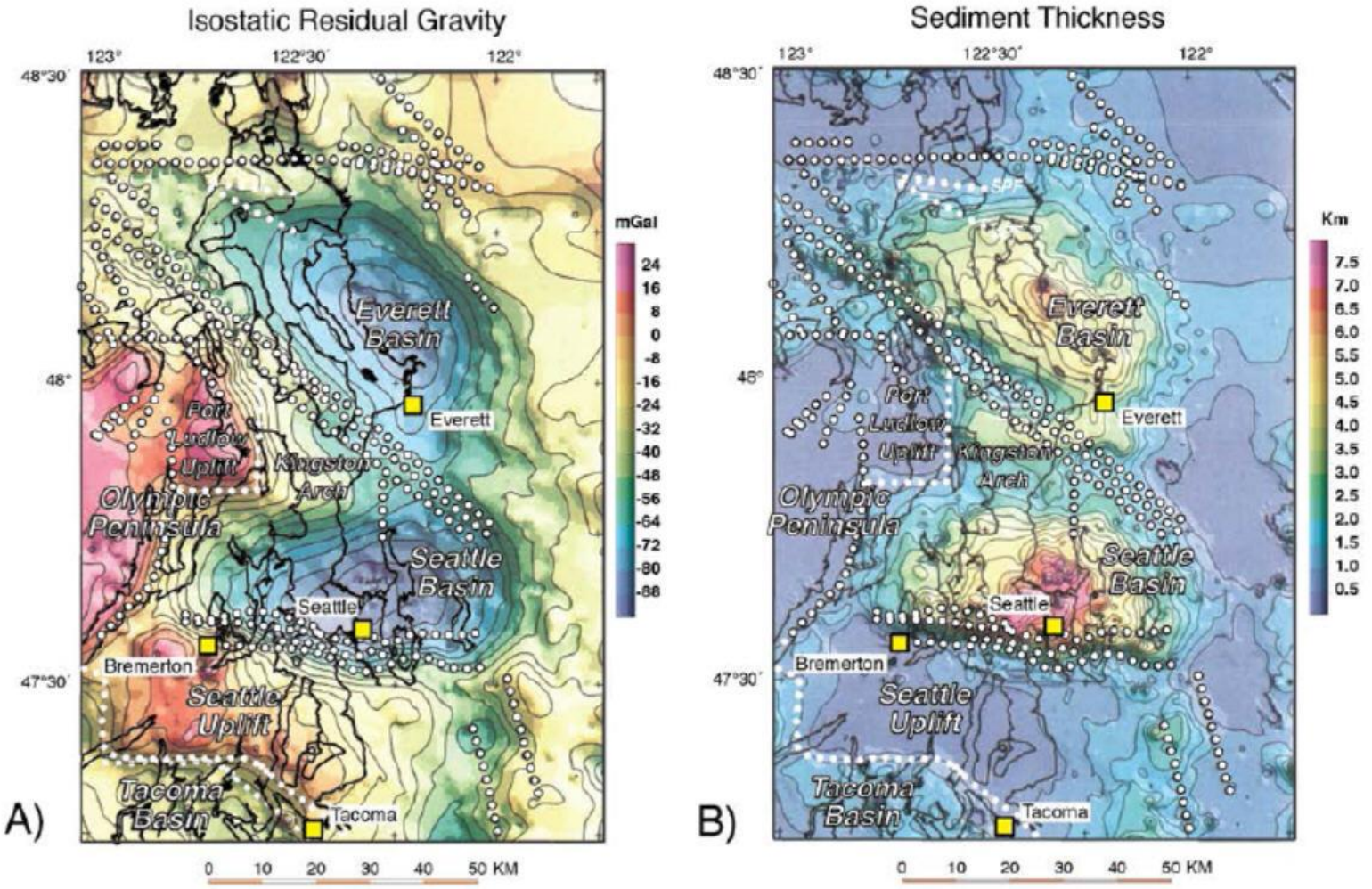
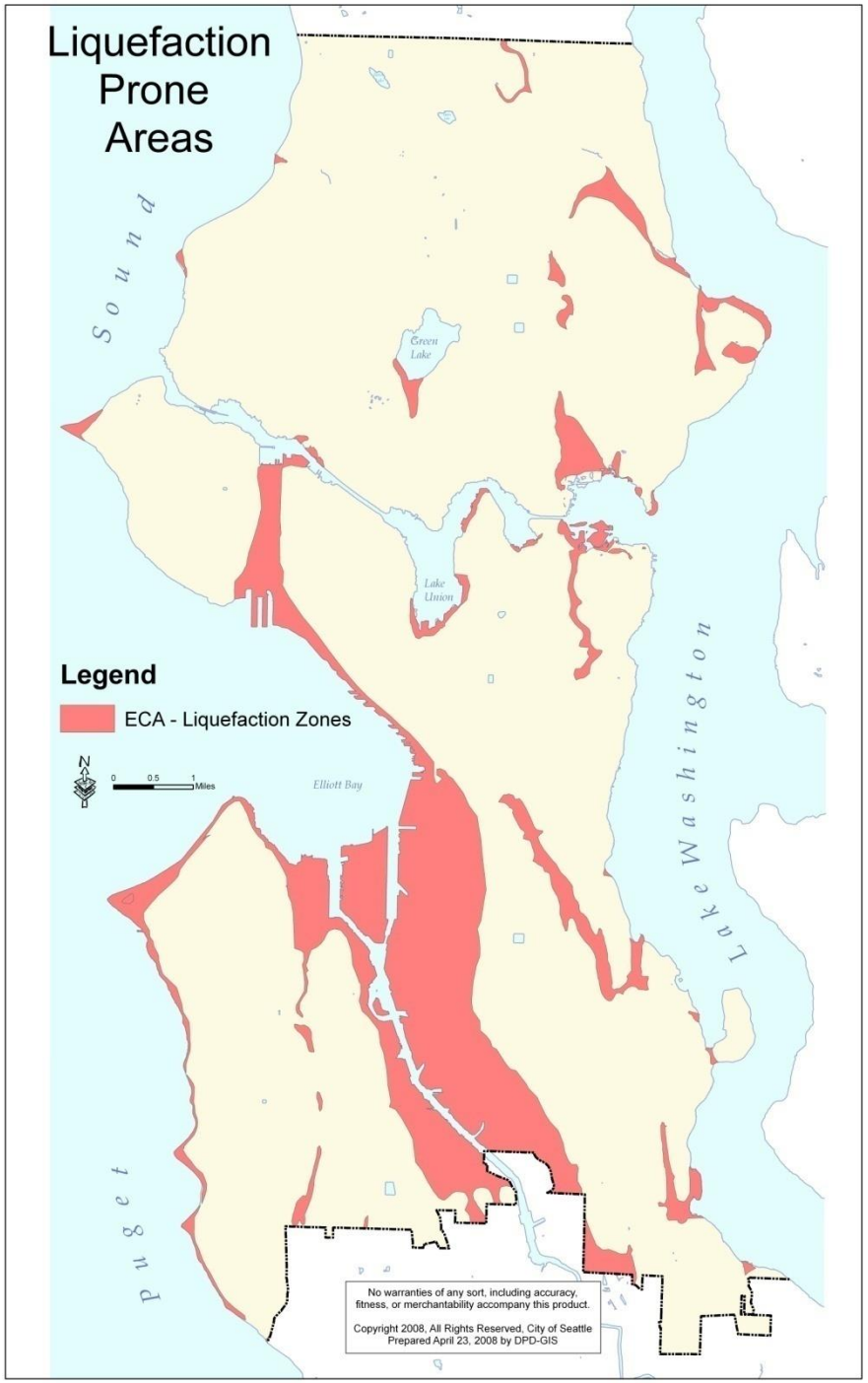


Figure 2. Maps of *A*, gravity residuals and *B*, sediment thickness, showing the Seattle and Everett sedimentary basins. Figure from Brocher and others (2001)

LIQUEFACTION/ LATERAL SPREADING



LIQUEFACTION

Phenomenon in which soil strength and stiffness are significantly reduced by earthquake shaking

Strength loss in soil due to build-up of water pressure

Occurs in *loose*, *saturated*, *sandy and silty soils*

LIQUEFACTION EFFECTS

Settlement and differential settlement (bearing capacity failure)

Loss of deep foundation capacity (settlement or breakage of piles)

Lateral spreading

Slope failure

Effect on ground motions

Flooding and uplift of utilities

Damage over very large areas


TOYOTA
DIGGA 8


BUILDING FOUNDATION
SETTLEMENT DUE TO
SOIL LIQUEFACTION


MOTEL
10F


PILE SUPPORTED, NO SETTLEMENT
SHALLOW (RAFT) FOUNDATION, 27” SETTLEMENT
GROUND, 15” SETTLEMENT
わかるまで
徹底的に
教える
Super
こしべ
マンツーマンシステム
東大OB会
自転車・原付バイク
放置禁止
24時間

Lindquist


BUILDINGS LEANING
BECAUSE OF FOUNDATION
SETTLEMENT DUE TO
LIQUEFACTION

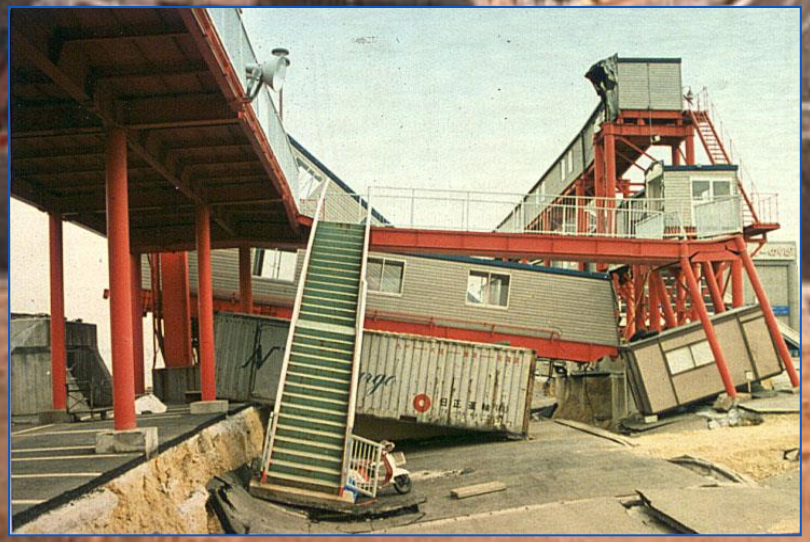


Photo courtesy of Prof. Misko Cubrinovski

University of Canterbury, New Zealand


Harder

LANDSLIDES

LANDSLIDES

Considerations for tagging:

Risk to life-safety

Cause of slide

Geology, groundwater, typical slide types in area

Cracks, leaning trees, running groundwater, bulges at toe of slope

LANDSLIDES

Considerations for tagging (cont.):

Potential for near-term sliding

Likelihood of aftershocks

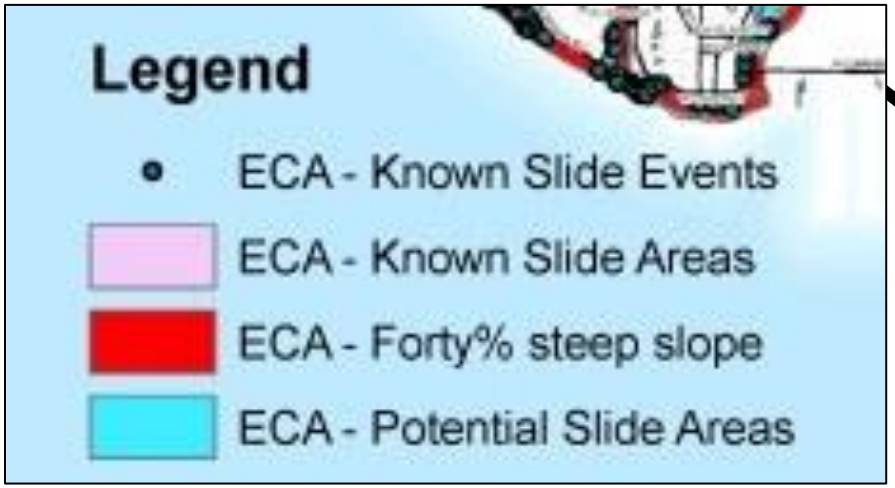
Foundation system of structure

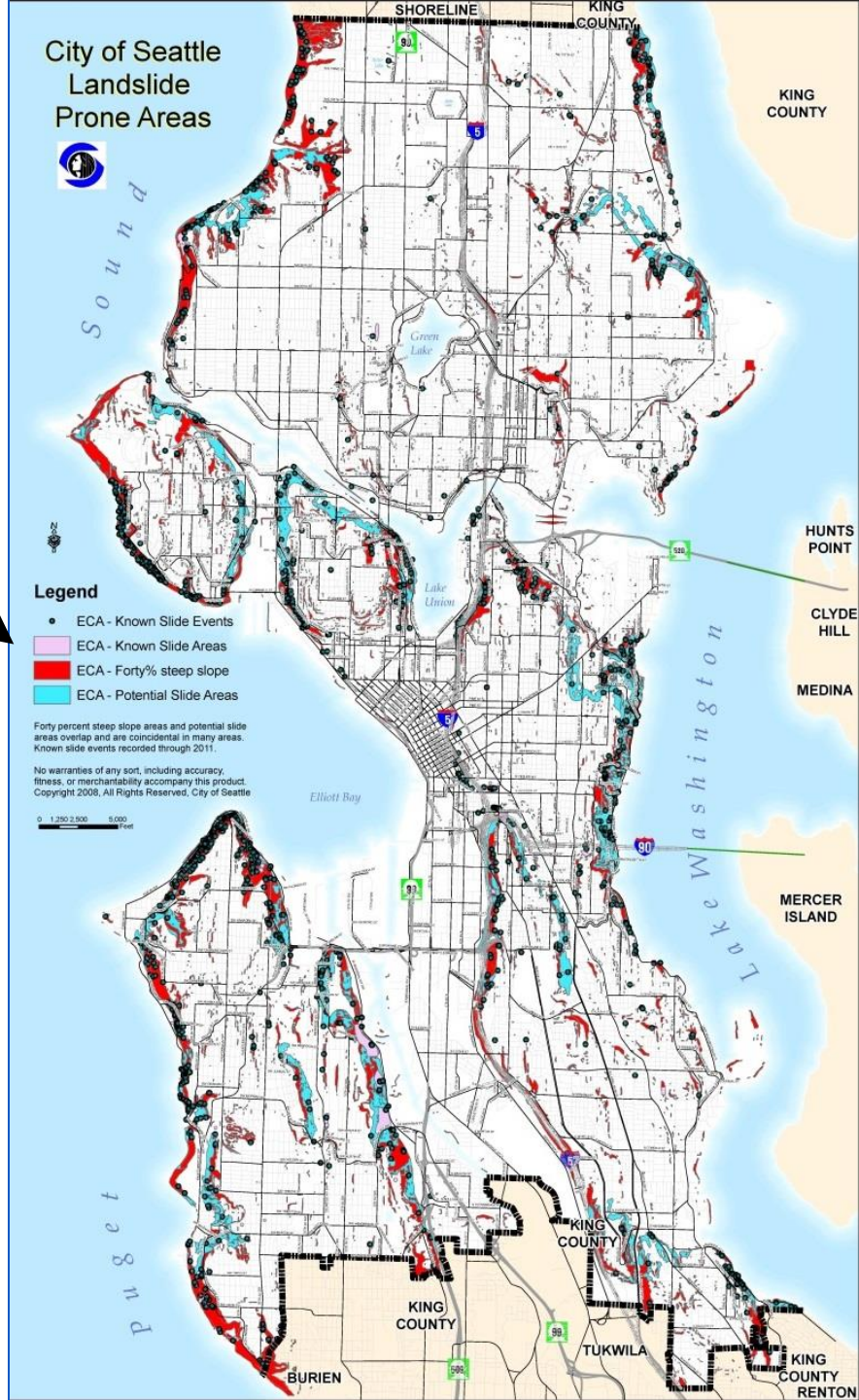
May be able to be conservative because of limited effect of tagging

May need help from geotechnical consultant

SEATTLE LANDSLIDE-PRONE AREA MAP

(Seattle Landslide Study, Shannon & Wilson 2000, 2002)





Seismically induced landsliding: A Scenario Study of Seismically Induced Landsliding in Seattle Using Broadband Synthetic Seismograms by Allstadt, Vidale, and Frankel, BSSA 2013

Sendai City Aoba Ward Oritate 5 Chome

Lindquist

Siu


SDCI (Seattle)

To be filled out by inspector

EXISTING CONDITIONS (write additional comments on back):

- **Include** written description or sketch on back, or attach photo for all "observed" conditions below
- **List** adjacent sites that are affected but untagged on back
- **Hazard Rating**: 1 = low to no hazard to life safety: 2 = moderate hazard to life safety; 3 high hazard to life safety
  Any rating of 3 is grounds for a RED posting. Any rating of 2 is grounds for a YELLOW posting. **Placards are to be posted only in the event of a declared emergency.**

	Observed	Not Observed	Description of Condition	Hazard Rating
	☐		Site Damage only	
	☐		Structural damage only	
1.	☐	☐	Minor/cosmetic damage to structure	1 2 3
2.	☐	☐	Collapse, partial collapse, or building off foundation	1 2 3
3.	☐	☐	Severe racking of walls, obvious severe damage and distress	1 2 3
4.	☐	☐	Slope failure or debris on site – no apparent/imminent hazard to structures or property	1 2 3
5.	☐	☐	Building damaged by ground displacement	1 2 3
6.	☐	☐	Slope failure has caused foundation damage or loss of foundation support	1 2 3
7.	☐	☐	Slope movement continuing under current conditions:	1 2 3
	☐	☐	Fresh breaks – sharp edges	
	☐	☐	Strained vegetation – stretched, tensioned	
8.	☐	☐	Building is in active slope failure zone	1 2 3
9.	☐	☐	Building in path of debris from slope failure zone Approximate distance from building to slide debris: _____	1 2 3
10.	☐	☐	Retaining wall leaning outward 5° (1:12 slope) or more from vertical: Approximate lean: _____	1 2 3
11.	☐	☐	Ground fissures on site: Approx. width: Approx dist from bldg:	1 2 3
12.	☐	☐	Scarps (set-downs) on site: Approx height: _____ Approx dist from bldg: _____	1 2 3
13.	☐	☐	Debris up against building, need removal	1 2 3
14.	☐	☐	Known catchment contains slide debris, removal required (geotech not required)	1 2 3
15.	☐	☐	Drain line(s) draining over slope failure zone	1 2 3
16.	☐	☐	Other condition, including drainage issues	1 2 3


FORD
RALPH PRATER FORD

HAZARDOUS MATERIALS

HAZARDOUS MATERIALS

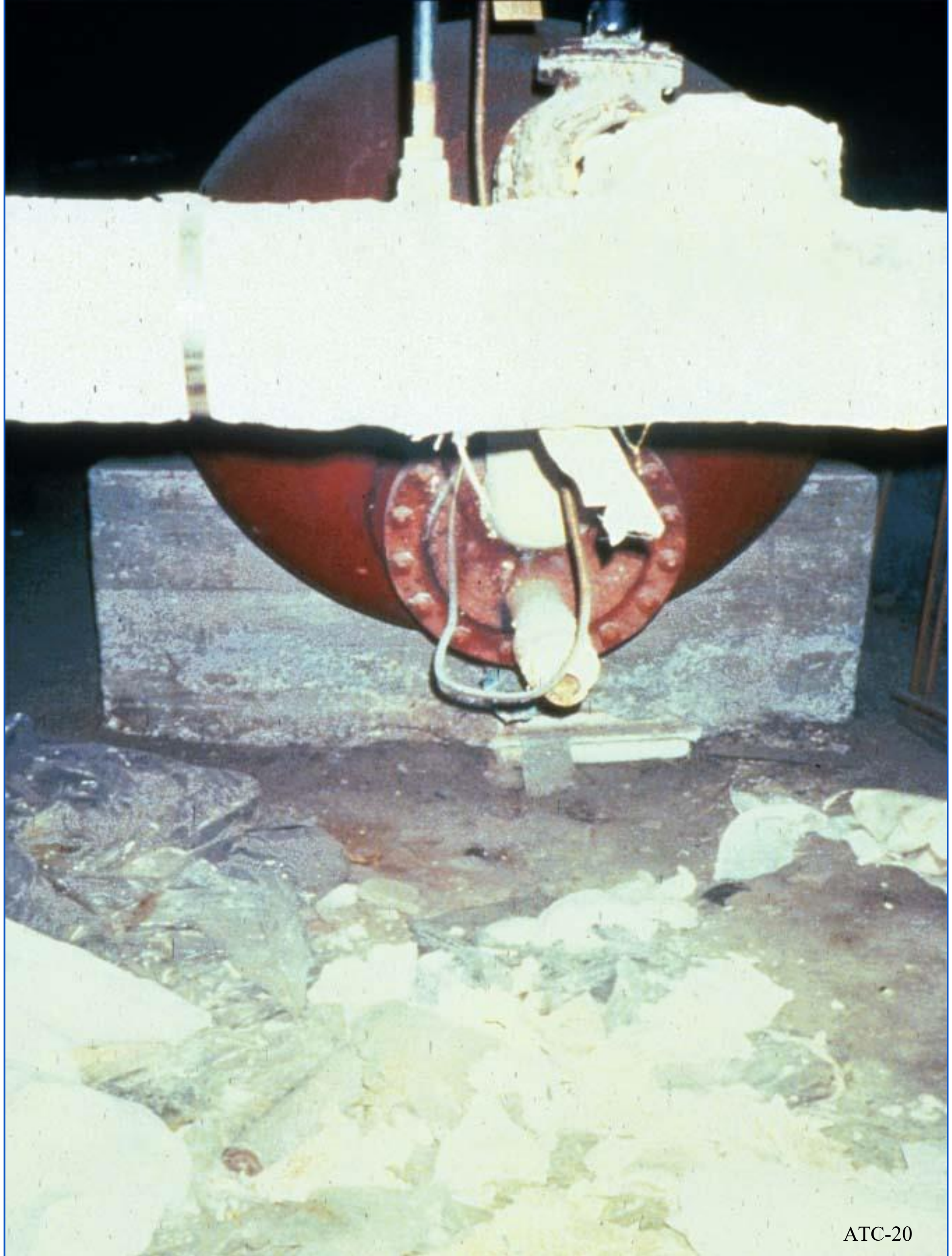
Recognition – Type of facility
National Fire Protection Association (NFPA) diamond marker
Fumes, odors
Visible spills

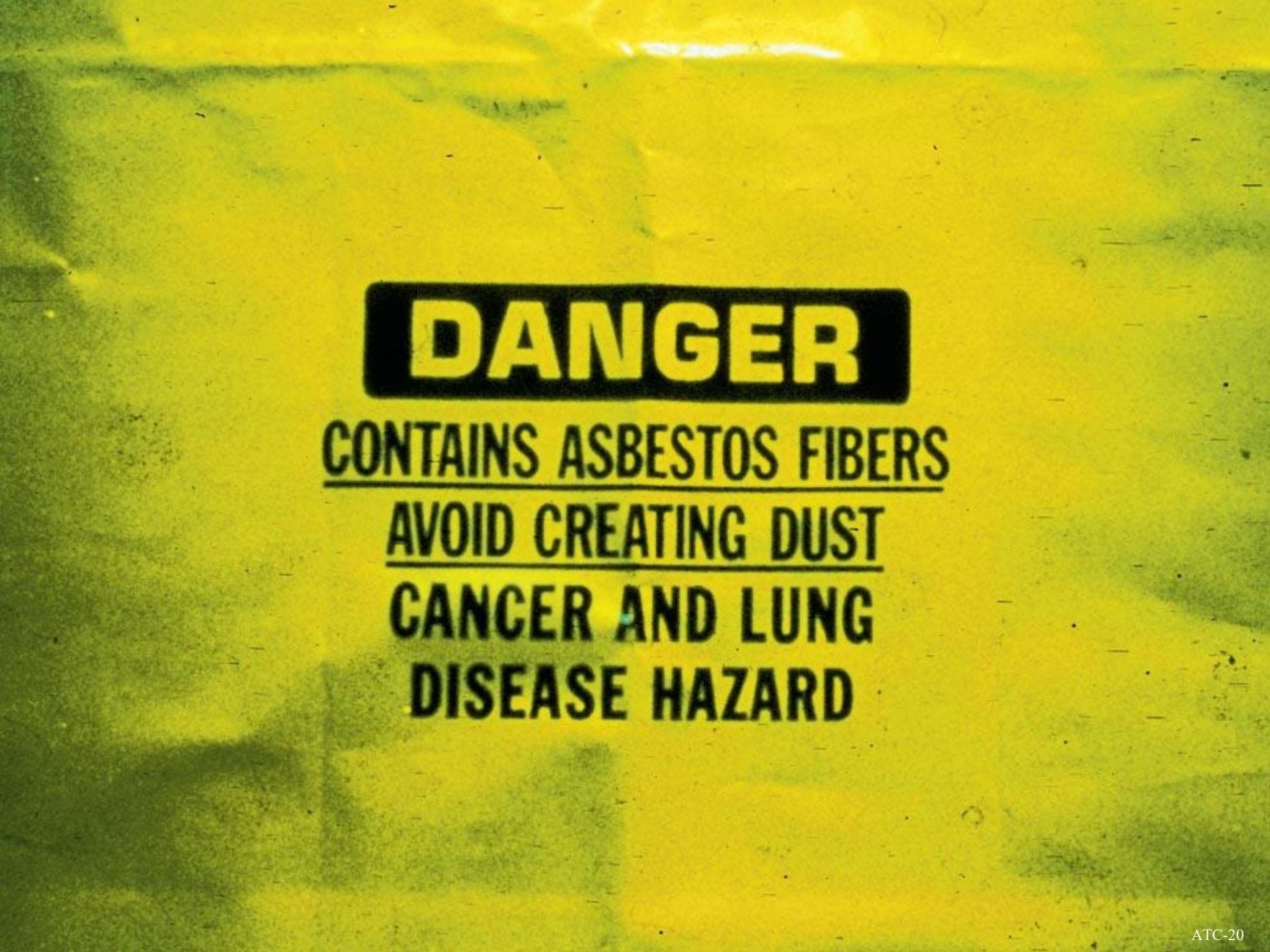
Actions – Leave and post area

Notify jurisdiction or fire department

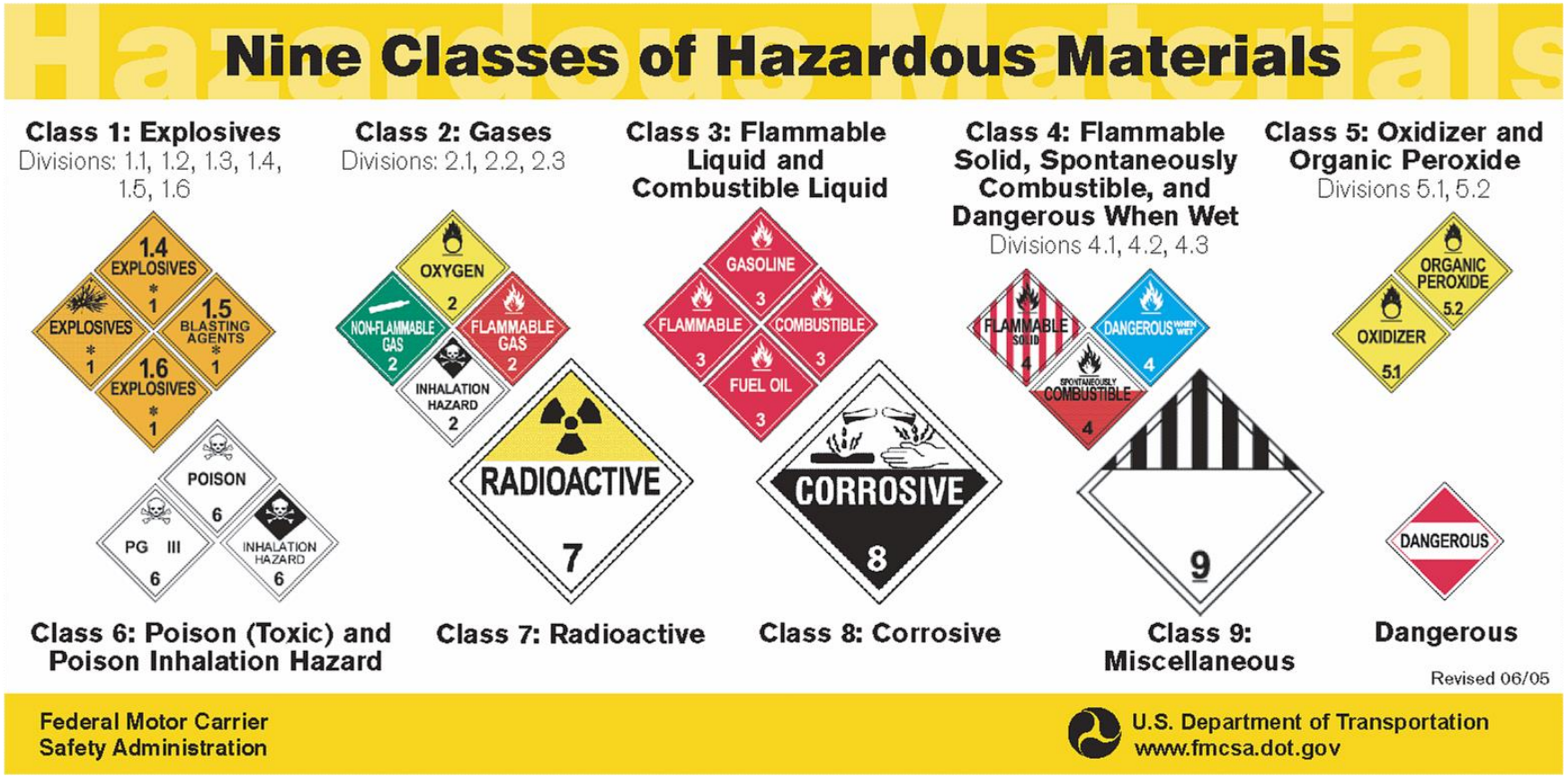
COMMON FAILURES CAUSING HAZMAT RELEASES

Building structural failures
Dislodged asbestos
Underground pipeline breaks
Short connector pipe breaks
Elephant's foot buckling of vertical cylindrical tanks
Overturning of elevated tanks
Sloshing from open-topped tanks
Falling containers
Equipment sliding or overturning

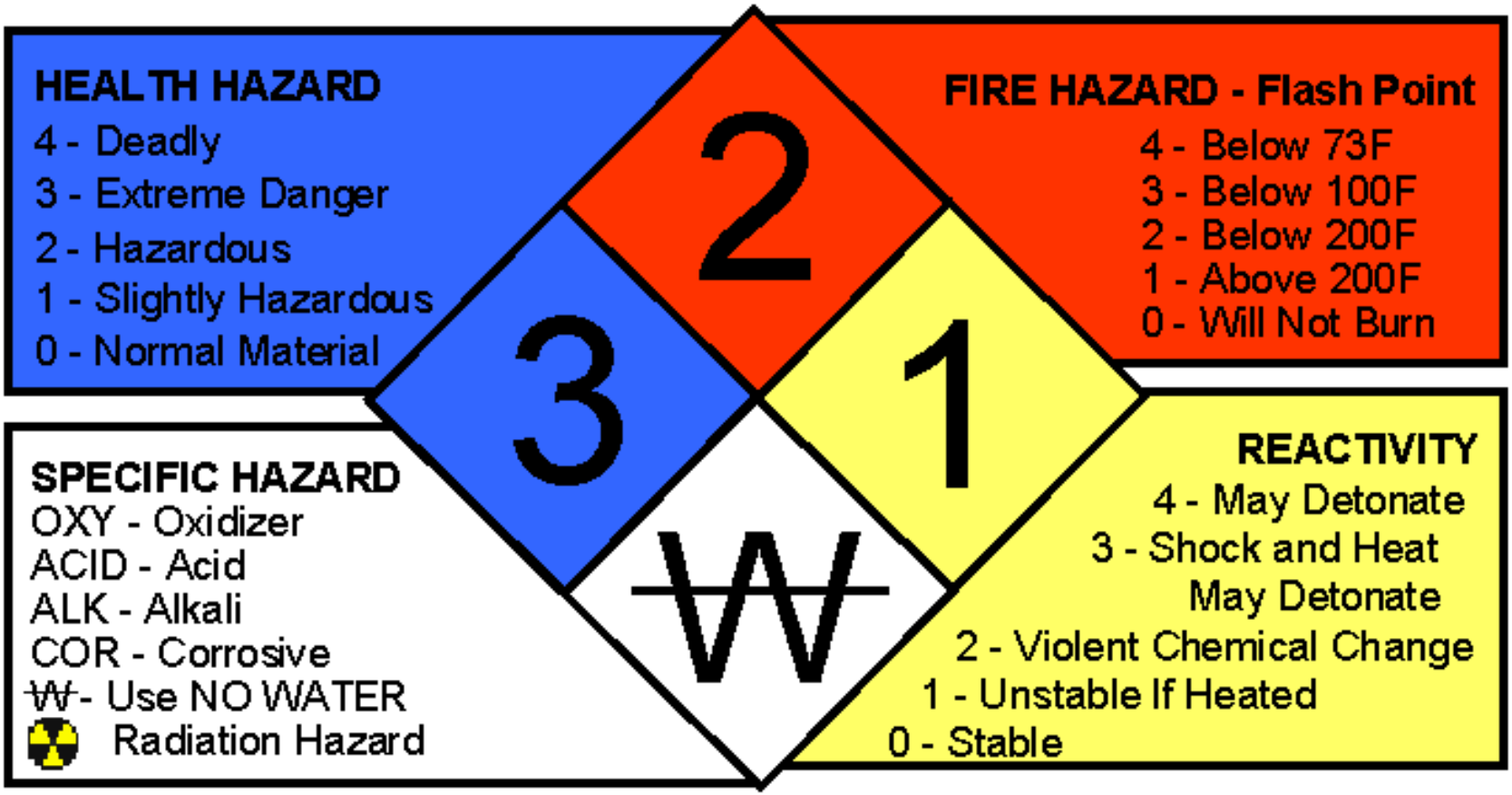

ATC-20


DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG
DISEASE HAZARD

USDOT HAZMAT LABELS



NFPA DIAMOND (CHEMICALS)



HMIS/OSHA LABELS

OTHER NON-SEISMIC HAZARDS

NON-SEISMIC HAZARDS

Wind Events (ATC-45)

- Hurricanes
- Tornados
- Other Wind Storms

Floods

Blast (explosions)

Fires

GENERAL PRINCIPLES

Structural safety principles are same as seismic

- Focus on immediate stability/imminent hazard
- Assume no immediate following event

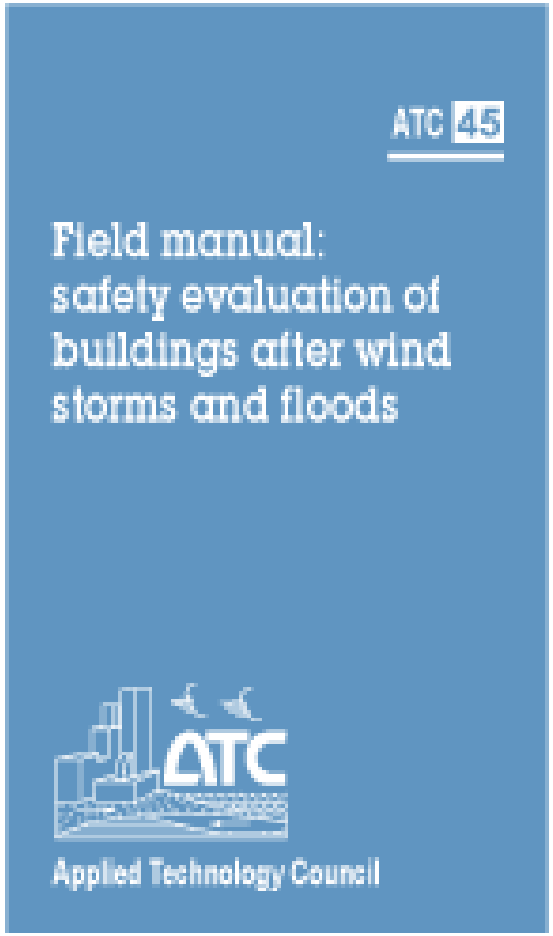
Follow instructions/policies of local jurisdiction

- Placards required, even if no structure remaining?
- Do we know the structure belongs on the site?

Be aware of, protect self from additional hazards

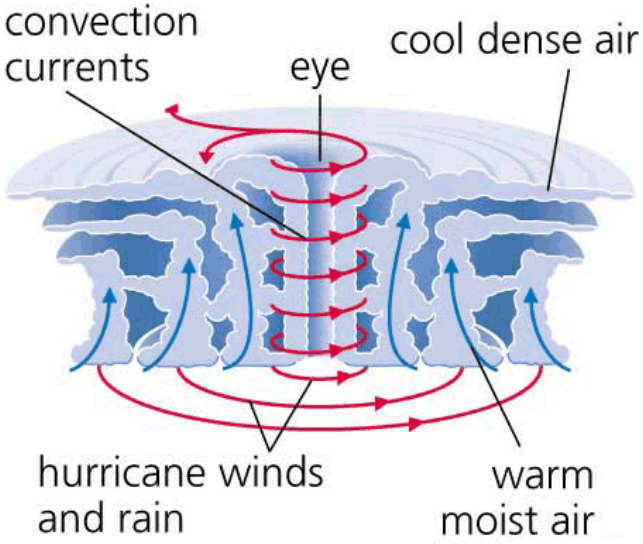
- Mold, chemicals (floods)
- Hazardous dust (blast)
- Airborne carcinogens (fire)

RESOURCE DOCUMENT (WIND & FLOOD)



ATC-45 HURRICANES

- ≥ 74 mph winds
- Building damage:
  - Building lateral force resisting system (wind force)
  - Storm surge/flooding
  - Debris impact




CALOES SAP


CALOES SAP


8945

ATC-45 TORNADOS

Smaller area, greater intensity vs hurricanes

Building damage:

- Strong winds near center (≥ 200 mph)
- Pressure drop at center

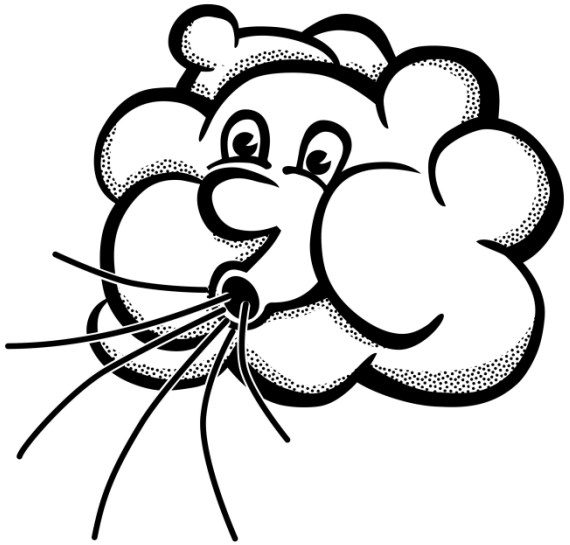

CalOES SAP

ATC-45 WIND STORMS

Linear wind storms (West Coast)

Building damage:

- High wind
- Wind-driven waves



ATC-45 FLOODS

Flash floods/other swift water

Inundation (slow-moving water)

Building damage:

- Water force on lateral force resisting system
- Foundation scour
- Unanchored buildings
- Mold, contaminated water


CalOES SAP

BLAST/ EXPLOSIONS

- Building damage
  - Overpressure on/in structures
- Assess nearby buildings

FIRE

Large-scale (wildfire)

Individual buildings

NATIONAL PARK SERVICE

LAFIRE.COM

FIRE – LARGE-SCALE (WILDFIRE)

May still require placarding

- See AHJ

Free-standing masonry/concrete walls & chimneys

FIRE – INDIVIDUAL BUILDINGS

Assess effect on structural stability

- Sagging floors
- Spalled concrete
- Burned wood beams/bearing walls
- Out of plane wall stability

POLITICS OF RECOVERY


MARCH-MACDONALD, INC
425-890-0061

PUBLIC SAFETY VS ECONOMIC RECOVERY

Pressure to reopen businesses

- ATC-20 by contract engineers for building owners (WP 5-2009)

Pressure to reopen streets

Hazard mitigation/abatement of unrepaired, tagged buildings (enforcement)

- Adjacent buildings affecting undamaged property
- Coordinate with Public Works departments on hazards to public right-of-way
- Historic preservation

Repair responsibilities

Beware fly-by-nighters


KOBE, JAPAN; JANUARY 1995
ホテル三陽
A-Z
COAST
PLANET


KOBE, JAPAN; JANUARY 1995
ATC-20

NEXT STEPS

Personal preparation (work and home)

Decide if want to volunteer

- In-state
  - WAsafe
    - Apply through member organization (AIA, ASCE, SEAW, WABO)
    - Unaffiliated => apply through WABO
- Out of state
  - CalOES (www.caloes.ca.gov)
    - Search for Safety Assessment.
  - Disaster Response Alliance (ICC/NCSEA) (www.disasterresponse.org)

SLIDE CREDITS

ASCE/SEI Chilean Earthquake Assessment Teams
Christopher Arnold
J. Marx Ayres
Ross Boulanger/UC Davis
Gregg Brandow
California Office of Emergency Services
Prof. Misko Cubrinovski/University of Canterbury
H. J. Degenkolb Associates
Jon Egan
Ronald P. Gallagher
Geotechnical Extreme Events Reconnaissance (GEER) Teams
GeoEngineers (J. Gordon)
Dr. Les Harder
Doug Lindquist
Los Angeles Department of Building and Safety
Los Angeles County Department of Building and Safety
John Meehan
National Fire Protection Association
National Oceanic and Atmospheric Administration
National Paint and Coatings Association
National Research Council

SLIDE CREDITS (CONT.)

Pacific Northwest Seismic Network
San Francisco Bureau of Building Inspection
Seattle Department of Construction and Inspections
Shannon & Wilson, Inc.
Stephen D. Pfeiffer
RDD Consultants, Inc.
Reid Middleton, Inc.
Robert Reitherman
Jonathan C. Siu
Yet M. Siu
SEAW Tohoku Reconnaissance Team
Steinbrugge Slide Collection, EERC
James Stratta
U.S. Geological Survey (Art Frankel)
Tom Wangerin
Washington Department of Labor & Industries
Wiss, Janney, Elstner Associates
Kit Wong

Postearthquake Safety Evaluation of Buildings

ATC-20